COMMERCIAL Service Manual

By K. M. NEWCUM

Suction Valves and Stuffing Box Seals on Commercial Units

CHAPTER 6—Commercial Condensing Units—Continued

Compressor Suction Valves

Compressor suction valves are those suction valves that are not located in the top of the pistons. Suction valves are located in the same plate as the discharge valves and their movement is the opposite of the discharge valve.

A typical Kelvinator suction valve is shown in Fig. 50. It is of the automotive poppet type. Another Kelvinator suction valve is shown in Fig 51.

Kelvinator Valves

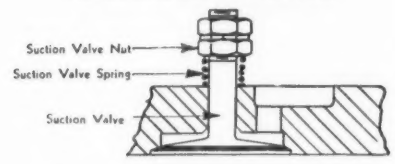

Fig. 50—Poppet-type suction valve.

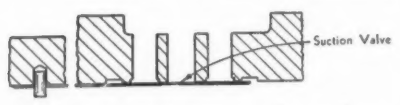

Fig. 51—Reed-type suction valve.

It is of the reed type. Its location in the compressor may be noted in Fig. 52, No. 13.

In Fig. 52 No. 18 is the suction gas chamber. The suction gas is drawn in through the entrance port via the suction chamber where any oil is drained down into the crankcase through the crankcase port, No. 19. The gas then passes upward through the gas chamber to suction valve No. 13.

On the down or suction stroke of the piston, suction valve No. 13, Fig. 52, is drawn downward and opens allowing the gas to be drawn into the cylinder chamber. When the piston starts back up on the compressor or discharge stroke, suction valve No. 13 closes and the gas is forced up through the discharge, No. 3, and out discharge port No. 2.

Several manufacturers are using this method of returning suction gases. Among the advantages advanced is that the refrigerant does not circulate through the crankcase and oil pumping is reduced. There is also a tendency for the cooler return vapors to cool the cylinder head.

In a design such as that used on the Brunner compressor both the suction and discharge shut-off service valves are located on the cylinder head. In this design the gas is drawn immediately into the suction valve.

Stuffing Box Seals

The shaft seal is of major importance in that it provides a seal between the atmosphere and the system around the revolving shaft.

A common packing gland was first employed as a stuffing box. Often it was necessary to loosen the stuffing box while starting the compressor, then tighten it when the compressor was in operation. This type box requires much attention and frequent repacking.

An addition to this older type stuffing box was a spring to keep a pressure on the packing gland. This improvement was helpful, but heavy losses of refrigerant and oil were still very common. When the system was working in a vacuum air would be drawn into the system resulting in high head pressure, moisture, etc.

The next major improvement in shaft sealing was the sylphon type of seal shown in Fig. 53.

This type of seal provides a seal at the revolving crank of eccentric shaft by means of a special metallic seal nose (B), which is held against the shaft shoulder (A) by the compression of spring (C).

The flexible metal bellows is soldered to the seal nose holder and the flange. The second point of seal is at the gasket joint (E).

Oil is provided to the seal nose from the crankcase of the compressor.

This type of seal is known as the "stationary bellows seal" for the seal does not rotate. Where this type of seal is used, a thrust bearing will be found on the opposite end of the shaft to provide bearing surface for the friction caused by the pressure of the spring.

An improvement over this design is the Frigidaire seal shown in Fig. 54. Note the spring (A) is on the outside of the bellows. This seal is known as the balanced seal as the design is such that any increase or decrease in crankcase pressure will respond equally on each side of the seal, thereby balancing the seal, permitting its use on compressors operating under variable pressure conditions.

Seal leaks may cause many service calls. In a system operating above zero gauge pressure, a continuous loss of refrigerant and oil may result necessitating continuous recharging.

Stuffing Box Assembly

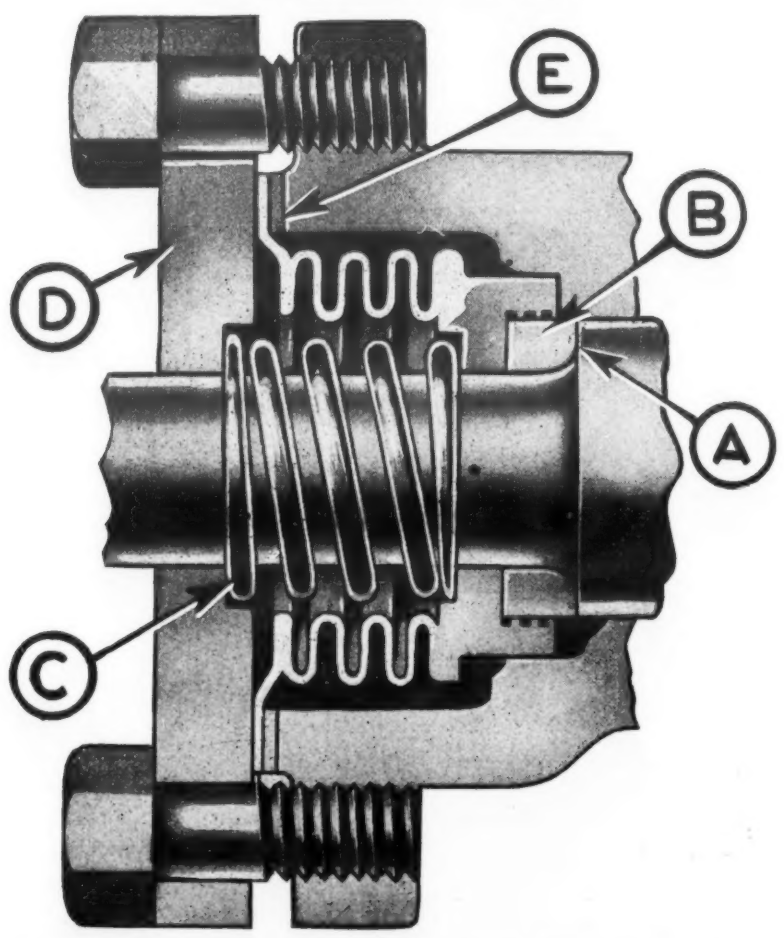

Fig. 53—Frigidaire stuffing box seal assembly. (A) Eccentric shaft shoulder; (B) bronze thrust collar or seal nose; (C) spring; (D) retainer plate; (E) gasket.

Valve Locations

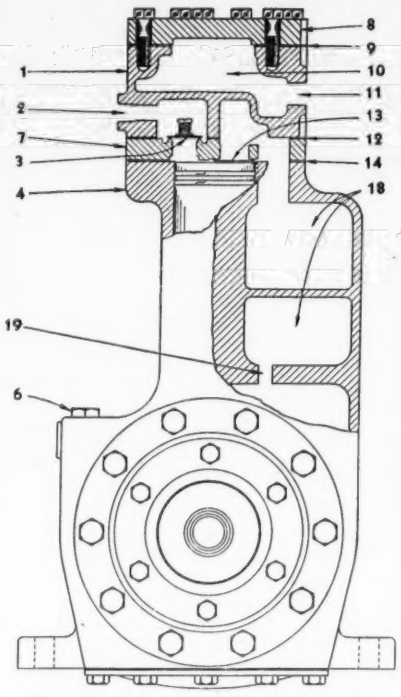

Fig. 52—Plan view of Kelvinator compressor showing location of valves and gas chambers.

Where the system is operating in a vacuum on the lowside, air may be drawn in while the system is in operation. Air in the system can cause no end of complicated troubles throughout the entire system.

Whether or not the seal is leaking should not be taken for granted when a system is constantly leaking or taking in air. A pressure of at least 35 lbs. in an SO_2 system, 40 lbs. in a methyl chloride system, and 50 lbs. in a Freon system, should be built up in the crankcase while compressor is idle and the seal thoroughly tested.

There are various methods for testing as given in Chapter 3 under *Common Refrigerants*. If any of these methods do not indicate a leak and there is still a doubt as to the tightness of the seal, the compressor body should be submerged in a suitable liquid solution such as kerosene, with the above pressure on the crankcase.

The slightest leak will develop a bubble in the solution. It is also suggested that the shaft be turned slowly while the seal is being tested as this rotation may bring out the leak otherwise not apparent.

One of the chief causes of seal leaks is a shortage of oil in the crankcase, which results in inadequate seal lubrication. The crankcase should always be checked when a leaky seal is located.

A leaking stationary seal is most often due to wear at the point of contact between the seal nose and the shaft shoulder. This wear results in a groove in the shaft and a flattening out of the seal nose.

It is impractical to install a new seal against a grooved shaft. It is also impractical to lap the shaft shoulder on the job, as the shoulder is case hardened and offers great resistance to lapping compounds. A leaky stationary seal should be repaired by installing a new shaft and a new seal.

Many service shops are equipped to recondition both worn seal and shaft.

The seal may be reconditioned, providing it is not too badly worn, by reshaping the seal nose to its original shape on a metal lathe. After reshaping, the seal nose should be polished on a piece of smooth plate glass. Use a paste made of Bon Ami and compressor oil.

If the shaft is but slightly grooved, the shoulder may be ground down just enough to remove the groove, then highly polished with extra fine lapping paper or compound and finished off with powdered pumice and oil.

When a new or reconditioned shaft and seal have been installed in a compressor, the compressor should run in for as long as possible, certainly not less than 15 minutes, with the crankcase pressure 0 lbs. or slightly above. Always test a new seal thoroughly before leaving the job, and check the crankcase oil level.

Stationary Seal

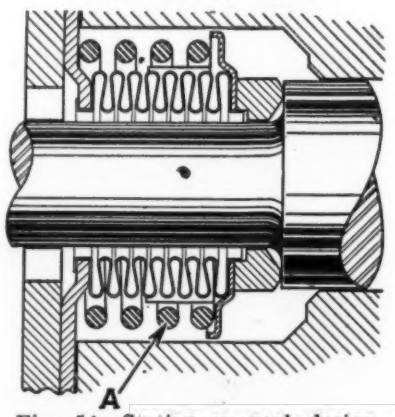

Fig. 54—Stationary seal design. "A" indicates spring.

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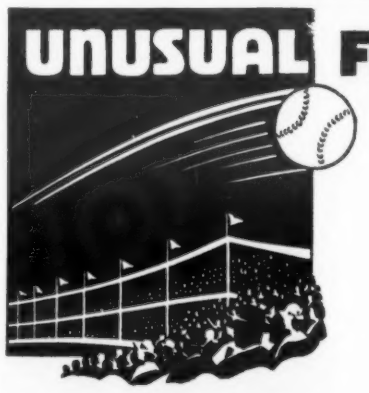

Gehrig Slugs Way to 5 Unusual Records

CONSISTENT hitting earned Lou Gehrig, Yankee slugger, 5 outstanding records. WORLD'S SERIES: Greatest total batting average of .422 in four series (19 games); Four home runs in four game series; Drove in nine runs in a four game series. MAJOR LEAGUES: Only major leaguer to drive in more than 170 runs three times; Leads major leagues by hitting nineteen home runs with the bases loaded.

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THREE DOLLARS PER YEAR
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August World Sales to Dealers Total 117,900

Sales Slightly Below Last August, but Year's Total Is Up 30%

DETROIT—World sales of 117,900 household electric refrigerators by manufacturers to distributing outlets during August sent the total for the first eight months of 1936 to 1,855,000 units, more than 30% over the figure for the same period last year, according to estimates compiled this week by AIR CONDITIONING AND REFRIGERATION NEWS.

Although slightly below August of last year, when world sales totaled 120,700 units, this year's August figures nevertheless were sufficient to send the 1936 eight months' total 166,400 ahead of the estimated sales for the whole of 1935, when 1,688,600 units were sold.

The August, 1935, total is still the all-time record for the month.

Household refrigerator sales by 15 member companies of National Electrical Manufacturers Association, as reported to Nema headquarters, totaled 109,656 units. During August of last year the 14 companies then reporting to the association sold 109,834 units.

World sales of commercial refrigerating machines, reported by the 15 companies who are members of the Commercial Refrigeration Section of Nema, totaled 17,726 units during August.

While this figure is a drop of 7,830 from the 25,556 units reported sold during July of this year, it may still be considered a creditable mark for the month. Comparable figures for 1935 commercial sales are not obtainable.

Sales of water coolers and beverage coolers, leaders in the commercial field throughout the year, continued strong during the month. Self-contained air conditioner sales, which totaled 1,404 during July, fell away to 342 in the figures given for the month following.

In the sales by states tabulation of Nema household equipment, New York as usual led, with 16,772. Pressing closely however was California, with sales of 12,968 units. Ohio was third with 7,980 sales.

A complete tabulation of Nema household and commercial sales during August, and of sales by states during the month, will be found on page 30.

Savings of Self-Contained Units Over Multiple System Total $2,561 on 96 Machines in One Year

* * *

CHICAGO—Modernization with individual units of the refrigeration system for the Marlborough apartment-hotel here effected an annual saving of $2,561, according to a comparative survey completed by the American Bond & Mortgage Bondholders' Committee which reorganized the property, reports Dayton Keith, chairman.

Figures were based on actual operating costs of the old system for the first 11 months of 1933, compared to costs for the same period in 1935 when the new system was in operation.

Ninety-six new hermetically-sealed units were installed to replace the old centralized multiple-system refrigeration. Cost of this installation was $13,960.50, including deduction allowance for trade-in of old equipment.

The new units were guaranteed against maintenance or repair work for five years. The committee, however, amortized the cost over a 10-year period, and estimated repair costs for the second five-year period would average 50 cents per box per month. Total cost over the amortization period, including both original purchase price and maintenance, was estimated at $1,684.05 annually.

The cost of electric power necessary to operate the old system during the 11-month period was found to be $2,524.90, according to the survey, and the cost of water for cooling the system was $701.05. Yearly repairs and maintenance averaged $288 and the loss of potential income of electricity sales to tenants was $531.36 for the period. This resulted in a total cost of operation and potential loss by operation of the old system of $4,045.31.

Under the new system of individual refrigeration the building profited by $2,361.26, after yearly amortization payments and cost of repairs had been included.

Mr. Keith explained that the first year of individual unit operation brought a return of 14.02% on the investment, the returns increasing with the years to reach a maximum of 140.20% on the last year, with an average return of 28.04% over the 10-year period.

Increased occupancy of 94.5% for the period of 1935 was taken into consideration, in comparing use of electricity to that in 1933 when the occupancy was 89.7%.

Second Historical Number

This is the Industry Pioneer Number of AIR CONDITIONING AND REFRIGERATION NEWS, the second of a series of three historial numbers. In the first (Sept. 9), the Tenth Anniversary Number, all of the information presented was digested from the 10-year files of the NEWS.

For this number, an all-inclusive number of manufacturers were invited to contribute information on members of their organizations whom they considered to be pioneers. This information was checked, rewritten, and correlated by the editorial staff to comprise the bulk of the material for the current issue.

To true Industry Pioneers whose accomplishments were not submitted for recording in this issue, the NEWS extends an invitation to contribute information for the third historical number, the Product Development Number, which will go to press on the eve of Nov. 4. All such information should be in the hands of the editorial department at least one week before that date.

For this coming issue biographies are not so suitable as stories relating the origin and evolution of particular components of refrigeration systems, with the part particular men played in their design and development.

Refrigeration on Dairy Programs

ATLANTIC CITY—Refrigeration in various forms and phases will have prominent places at sessions of the conventions of the International Association of Ice Cream Manufacturers Oct. 15 to 17, and the International Association of Milk Dealers, Oct. 12 to 14.

"Organization and Operation of a Cabinet Service Department" will be discussed by O. F. Boyer, Ice Cream Refrigeration Service, Los Angeles; John W. Burdan, Philadelphia Dairy Product Co., will talk on "Economical Layouts for the Manufacture of Novelties," and will include a discussion of brine tank layouts; R. R. Gockley,

(*Concluded on Page 2, Column 2*)

Nema Chairman

THOMAS EVANS

Porcelain Enamelers Study Architecture

CLEVELAND — Porcelain enamel and its relation to architecture was the dominant topic of discussion at the sixth annual meeting of the Porcelain Enamel Institute Oct. 1-2.

The idea of using porcelain enamel for exterior and interior surfaces of homes, offices, and factory buildings was first put to practical test less than three years ago; yet in 1936 approximately 15% of the output of the porcelain enamel industry will go toward this purpose, it was revealed at the meeting.

Promotional programs of the Porcelain Enamel Institute, which is the association of American manufacturers of porcelain enamel products, will be directed almost entirely toward greater use of their products in the architectural field, members of the institute directed at the close of the sessions.

Foreign markets may afford an opportunity for considerably greater sales volume of porcelain enameled architectural products than the United States, members of the institute were told by George F. Taubeneck, editor of AIR CONDITIONING AND REFRIGERATION NEWS, at the Friday session.

Going into detail on the economic situation and building needs in New

(*Concluded on Page 2, Column 4*)

Evans & Harlan Reelected Nema Division Heads

NEMA and ACMA Men Attend Meetings in Cincinnati

CINCINNATI, Oct. 6 — Thomas Evans, president of Merchant & Evans Co., was re-elected chairman of the Refrigeration Division of National Electrical Manufacturers Association (Nema) and also chairman of the Household Refrigeration Section of the Refrigeration Division; and J. A. Harlan of Kelvinator Corp. was re-elected chairman of the Commercial Refrigeration Section, at the annual meeting held today at the Netherlands Plaza hotel here.

The Refrigeration Division advertising and sales promotion committee met on Monday, and both the Household and Commercial Section meetings were held today.

Next meeting of the Refrigeration Division will be held Dec. 15 at the Drake hotel in Chicago.

The semi-annual meeting of the Air Conditioning Manufacturers Association (ACMA) will open tomorrow (Wednesday) at the Hotel Gibson.

Officers of the ACMA, who were elected at the annual meeting in the spring, are as follows: J. F. G. Miller, the B. F. Sturtevant Co., president; J. A. Harlan, Kelvinator Corp., vice president; P. A. McKittrick, Parks-Cramer Co., treasurer; and William B. Henderson, executive vice president.

Formal Dedication of Kelvin Home Oct. 14

DETROIT—A committee composed of Gov. Frank D. Fitzgerald of Michigan, Mayor Frank Couzens of Detroit, and other business and industrial leaders will be in charge of the formal presentation to the public on Oct. 14 of the completely air-conditioned and electrified Kelvin Home, Kelvinator's contribution to American home building standards, President George W. Mason announced this week.

Presentation ceremonies will take the form of a luncheon to be tendered by the Kelvin Home celebration committee to local, state, and national leaders in business, industry, public

(*Concluded on Page 2, Column 3*)

Houston Frigidaire Dealer Who Made First Sale in 1922 Explains Formula for Selling Higher-Priced Units

HOUSTON, Tex.—Through 14 years of electric refrigerator retailing, W. W. Short, local Frigidaire dealer, has progressed from salesman to store owner and president of the Houston Salesmanship Club. He is a real "pioneer" in retail refrigeration sales activity.

Mr. Short sold his first refrigerator in 1922. A year later he became manager of a retail refrigerator store, and held that position until he formed his own business, the W. W. Short Co., in 1933.

Today, Mr. Short employs eight or nine salesmen, and sells about 1,000 refrigerators annually in addition to a large volume in gas ranges, washing machines and other household appliances.

Mr. Short endeavors to sell only the large higher priced units.

"Our men are trained not to be overly-eager to close a sale, but to sell the prospect refrigeration and what the customer can afford, even at the risk of losing an occasional sale," he explains. "Pushing the better units seldom loses a sale, and our customers are then our best salesmen —they help us sell their friends."

By employing a graduated commission scale—the better the unit, the higher the commission—Mr. Short manages to keep his salesmen on their toes in their efforts to sell only the best units, and the volume of business is consequently increased.

Another interesting sales promo-

(*Concluded on Page 2, Column 4*)

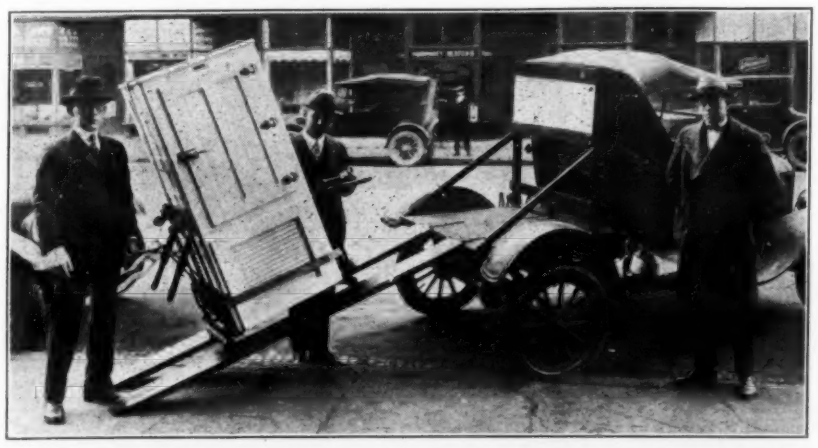
1,520 Refrigerators Sold by Alabama Power in 2 Mos.

BIRMINGHAM, Ala. — Alabama Power Co., broke sales quotas for three major electric appliances during July and August, according to D. S. Sutherland, sales director.

Estimates and actual sales figures follow: refrigerator quota, 1,200—actual sales, 1,520; range quota, 300—actual sales, 714; water heater quota, 150—actual sales, 318.

Alabama Power expects to sell 1,025 refrigerators during September and October, Mr. Sutherland says.

Delivery System—1925



This 1925 Kelvinette is being loaded onto a Ford roadster pickup for delivery. This was said to be the first self-contained refrigerator.

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Kelvinator Teaches 571 Star Salesmen More About Salesmanship on Cruise to Havana, Cuba

By T. T. Quinn

Kelvinator's floating sales forum, the Cunard-White Star liner *Franconia*, docked in New York City last Wednesday after nine days of cruising which included a two-day stop-off in Havana for the 571 salesmen, dealers, distributors, company officials and guests aboard.

Although the cruise was intended primarily as a reward for record-breaking sales performances established by the 326 prize-winners—dealers and salesmen—Kelvinator officials saw to it that the men were equipped for even greater records in 1937 by giving them, daily, bits of potent sales information to digest along with their recreation, deck sports, and relaxation.

Ably directed by the cruise committee, composed of Advertising and Sales Promotion Manager S. C. Mitchell as chairman; Walter Jeffrey, W. E. Saylor, John S. Garceau, F. G. Hulburd, Truman Steinko, Ralph Hunter, and E. W. Shattuck, the nine-day voyage was a well-planned potpourri of work and play, with the former having just enough of the spotlight to keep the latter from becoming boresome.

Keynote of the cruise was sounded by Vice President Henry Burritt at the welcome meeting, first day out, when he said:

"We want all you men to have a grand time; but we know that you will be interested, at the same time, in learning more about the business you're in—things that will enable you to make 1937 an even more successful year for you than 1936."

In building its sales training program for 1937, Mr. Burritt said, Kelvinator feels that the men best equipped to assist in the work are those who have stamped themselves as outstanding salesmen by their performances and sales records in 1936.

Questionnaires compiled by Research Service, Inc., were distributed, and the salesmen asked to fill in their experiences, as a guide to the formulation of the company's 1937 sales training program.

Kelvinator officials were introduced at the opening meeting. These included, in addition to President George W. Mason and Mr. Burritt, the following:

Commercial Sales Manager J. A. Harlan, Mr. Mitchell, Assistant to the Vice President Godfrey Strelinger, Utility Sales Manager Campbell Wood, Public Relations Director Elmer L. Sylvester, Service Manager E. A Siebert, Laundry Equipment Sales Manager V. T. McIntyre, Domestic Sales

(*Concluded on Page 2, Column 5*)

George N. Congdon, Business Manager Of News, Dies

DETROIT — George N. Congdon, treasurer and business manager of the Business News Publishing Co., which publishes AIR CONDITIONING AND REFRIGERATION NEWS, died suddenly Thursday night, Oct. 1, at his home here.

Mr. Congdon had been in ill health for about 18 months, however, and just prior to his death had taken a two-weeks rest in northern Michigan.

Joining the Business News Publishing Co. in 1927, Mr. Congdon was elected treasurer early in 1928. He was widely known and highly respected by everyone who had business dealings with the NEWS. He will be remembered by the staff as a man who always had time to listen to the problems and troubles of others, but who never mentioned his own.

Born in Amesbury, Mass., 39 years ago, he moved to Detroit as a youth and was graduated from Central High school here. During the World War he served with the Field Artillery, and acted as gunnery instructor in many of the major training camps throughout the country.

Following the war he worked for the American Car & Foundry Co. for a time, attended Highland Park Junior College in 1921 and 1922, and then went to the University of Michigan. He was graduated in business administration from the University of Michigan in 1924. He was then employed by the Tillen Co. in Detroit in the capacity of business manager until 1927.

He is survived by his wife, Bernice, and father, Arthur G. Congdon.

In Memoriam

GEORGE N. CONGDON

Refrigeration on Dairy & Ice Cream Programs

(*Concluded from Page 1, Column 2*)

Dairymen's League Cooperative Association, will address the convention on "Frozen Cream—The Best Method of Handling and Use."

Two speakers on the milk dealers convention program are H. C. Guild, Vilter Mfg. Co., N. Y., and Crosby Field, Flakice Corp., Brooklyn. Mr. Guild will explain the importance of cube ice in the dairy industry, and Mr. Field, "The Use of Flakice Frozen Water Ribbons in the Dairy."

Kelvin Home to Be Dedicated Oct. 14

(*Concluded from Page 1, Column 5*)

health, building, architecture, home economics, and allied fields interested in the advancement of American living conditions.

The luncheon, to be held at 1 p. m. at the Detroit Athletic Club, will be followed by an inspection tour of Kelvin Homes recently completed in Detroit.

Guest speakers at the luncheon will include Peter Grimm, president, William A. White & Sons, and former president of the Real Estate Board of New York; Lulu G. Graves, consultant in nutrition and organization of dietary departments; Francis Keally, architect; Dr. Shirley W. Wynne, formerly health commissioner of New York City; and George W. Mason, president of Kelvinator Corp.

In addition to Gov. Fitzgerald and Mayor Couzens, membership of the Kelvin Home celebration committee includes: C. R. Hook, president, American Rolling Mill Co.; Walter McLucas, president, National Bank of Detroit; Henry F. Vaughan, commissioner of health, Detroit; Mrs. Nels Johnson, president, City Federation of Women's Clubs; W. E. Levis, president, Owens-Illinois Glass Co.; Henry Shelden, president, Shelden Land Co.; H. S. Wherrett, president, Pittsburgh Plate Glass Co.; and T. D. Webb, vice chairman, Federal Home Loan Bank Board.

The Kelvin Home, the result of scientific research on the part of Kelvinator Corp., applies the latest findings in the fields of air conditioning, refrigeration, heating, and architectural design to the needs and desires of the homeowners of America.

Officers Reelected by Porcelain Enamel Institute

(*Concluded from Page 1, Column 4*)

Zealand, Australia, Java, India, Egypt, Palestine, Holland, Sweden, and England, Editor Taubeneck pointed out reasons why these countries should prove to be especially receptive to promotion of the use of porcelain enamel in new building projects.

The advent of air conditioning, he declared, calls for an entirely new school of architecture in hot climates, and should undoubtedly spur a wave of new residential, office, and factory construction in the tropics in coming years, amidst which porcelain enamel has the opportunity of finding a place.

Other speakers included Emery L. Lasier of Niagara Falls, George S. Blome and Richard H. Turk of Baltimore, Herman L. Cook of Muskegon, Earle S. Smith of Toledo, and E. D. Chase and George P. MacKnight of Chicago. President R. G. Calton of Nashville, Tenn., presided at the sessions; and Robert A. Weaver, president of the Ferro Enamel Corp. of Cleveland, was host to the meeting.

Members spent two evenings at the Great Lakes Exposition, which closed on the day following their visit.

The entire staff of officers of the institute was re-elected, as follows: R. G. Calton, president; F. E. Hodek, vice president; Emery L. Lasier, vice president; George P. MacKnight, secretary; and William Hogenson, treasurer.

The sales conference on the morning of Oct. 1 was opened by Mr. Lasier, chairman of the Institute's Educational Bureau. This consisted of reports by the bureau's sectional chairmen and presentations and proposals for expanded activity in 1937, and a summary by Mr. MacKnight.

Mr. Lasier outlined the history of the bureau since its organization at the fourth annual meeting of the institute in Cleveland, May 16, 1934.

Herman L. Cook of the Norge Corp., chairman of the recently formed production control section, spoke on "Controlling Production." The section's proposed activities, Mr. Cook said, will consist of production cost studies, cooperation in designing for the most efficient production possible, general check-up on the industry's production methods, and uniformity studies.

The presentation, "Why We Advertise," by H. D. Chase of the Chicago Vitreous Enamel Product Co., chairman of the advertising and sales promotion section, consisted of a report of his section's activities since 1934 and its proposal for increasing the industry's cooperative advertising campaign for 1937. He pointed out the need for further advertising in a number of trade and business papers if the industry is to maintain its present markets and get new ones.

In his presentation, "Spreading the Gospel of Porcelain Enamel," Mr. MacKnight reviewed the reports and proposals of the sectional chairmen and emphasized the fact that it is the job of the Porcelain Enamel Institute to coordinate all of the bureau's activities as well as the other cooperative work of the industry.

Among the important additions to the institute's program for 1937 passed at the morning session and by the Board of Trustees at their luncheon meeting, were the following: an annual short course or open forum for enamelers to be sponsored and supervised by the institute; establishment of a "Porcelain Enamel Week" to be conducted each year in conjunction with the institute's educational program; approval of an administrative budget for 1937; inauguration of an intensive membership campaign; and a proposal for the establishment of an all-porcelain enameled kitchen.

Veteran Dealer Tells How He Sells 'Up'

(*Concluded from Page 1, Column 2*)

tional scheme which this retailer employs is the use of a card index for the prospects of each salesman. Salesmen are protected on these prospects for only 30 days, and no additional prospects may be indexed until some in the file have been closed or removed.

The men work in rotation on the floor, and sales go to the man closing the deal unless the prospect is in the active file of another salesman.

Diversified advertising and stimulating sales contest round out the sales program employed by the Short store.

One effective contest held recently was a "Set Your Own Quota Contest" in which each salesman set his own quota for a six-week period. The higher the quota set, the higher the commission for each sale above quota.

"By keeping something going, we keep our men fighting hard every day," concludes Mr. Short. "And this refrigerator business is seasonal for only those retailers who let it become so—our business continues the year around."

Sales Ideas & Plans Given to Kelvinator Salesmen on Cruise

(*Concluded from Page 1, Column 5*)

Manager M. S. Bandoli, and Housing Division Manager L. G. Estep.

Other factory men with whom the visitors were made acquainted were John Garceau, Walter Jeffrey, Fred Hulburd, E. W. Lothrup, Bill Saylor, Truman Steinko, E. V. Walsh, A. H. Reinach, Ralph Hunter.

P. L. Miles, range and water heater sales manager, was not around to be introduced on the trip down, but it was announced he would join the cruise at Havana and make the return voyage.

Speakers of national prominence featured the second day's program. Opening the session, President Mason predicted an even greater 1937 for the company than 1936, which, he said, had been Kelvinator's greatest year.

Refrigerator models for next year, he promised, would be no more attractive, with more convenience features, than the 1936 units.

Kelvinator is definitely in the home air-conditioning field, Mr. Mason declared, and traced the history of the Kelvinator research home, and the work and planning for it.

Programs of expansion, both in Detroit and Grand Rapids, make it definitely certain that "big things will happen at Kelvinator in 1937," Mr. Mason concluded.

Robert F. Elder, associate professor of marketing at Massachusetts Institute of Technology and a research worker of considerable experience in the development of the technicolor motion picture, spoke on "Selling as an Exact Science."

Next speaker, Vergil D. Reed, assistant director of the Census of Business in the Bureau of Census, Department of Commerce, urged his listeners to "Eliminate Blind Flying from Selling."

Thomas M. Beck, president of Crowell Publishing Co., publisher of *Collier's, American, Woman's Home Companion,* and *Country Home* magazines, featured the third afternoon's program with an address on "Selling Goods."

Mr. Beck's talk, through the medium of personal experiences, stressed the importance of ingenuity, perseverance, courage, and willingness to work in building up a sales record of lasting importance.

Highlight of the stop-over in Havana was a luncheon given by President Mason, and attended by leading Cuban officials, the American ambassador, and Cuban business men, at which trade relations between the two countries were discussed.

At the speaker's table were, in addition to high Kelvinator officials, Dr. Jose Manuel Cortina, Cuban Secretary of State; Dr. Rafael Santos Jiminez, Postmaster General; Dr. Antonio B. Mendietta, mayor of Havana; Jefferson Caffery, U. S. ambassador; Walter Donnelly, U. S. Commercial Attache; C. R. Cameron, U. S. consul general; M. S. Valencia and Juan Sabates of the Cuban Tourist Commission, and M. R. Aranello, president of the Aranello Co., Kelvinator distributor for Cuba.

Final day of the cruise was designated as "Kelvinator's Day," and both morning and afternoon meetings featured addresses by men in charge of the various divisions of the company's activities.

Vice President Burritt led off the program as chairman, introducing President Mason, who asserted that Kelvinator's 1937 program would be built around three things: products, facilities, and organization plans.

Mr. Burritt emphasized the part that sales research had played in the formulation of Kelvinator's 1937 selling program. A six-months' survey, covering all parts of the country, has shown Kelvinator where the 1937 business opportunities lie, he said. Next year's program, he asserted, will be built around facts.

B. B. Geyer, board chairman of the Geyer, Cornell & Newell agency, explained why advertising in national magazines is the most effective, from the standpoint of both sales expense and coverage. Broad basis of Kelvinator's 1937 program, he said, will be along lines similar to those followed this year, with the preponderance of the advertising going to national magazines.

Public Relations Counsel Edward L. Bernays closed the morning's program with an address in which he emphasized that a business, to be a success, must make its public interests coincide with those of private citizens.

Afternoon session of "Kelvinator's Day" was taken up by more specific discussions of the company's products, and the plans back of them for 1937.

Speakers included M. S. Bandoli, household; J. A. Harlan, commercial; P. L. Miles, ranges; V. J. McIntyre, laundry; S. C. Mitchell, advertising; Godfrey Strelinger; E. L. Sylvester, Temperature Research Foundation; and L. G. Estep, Kelvin Home.

PIONEERING

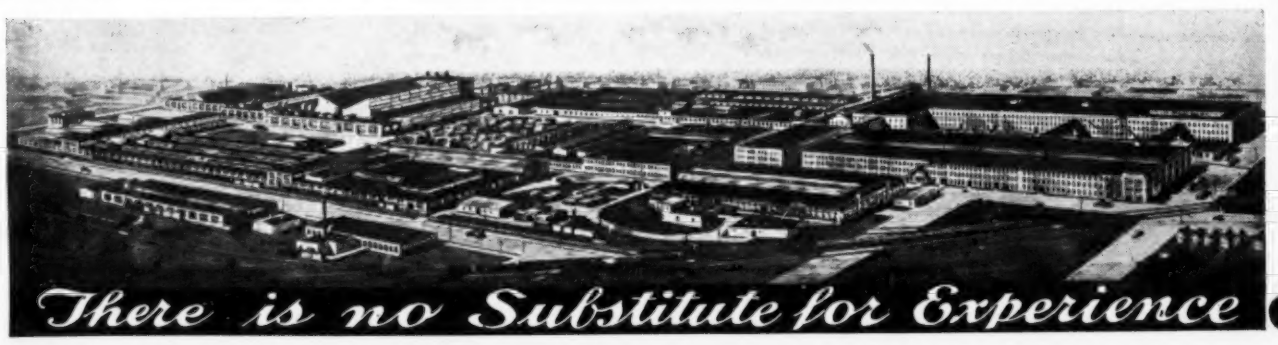
Servel's progress in Commercial Refrigeration and Air Conditioning has been marked by thoughtful, consistent pioneering . . . Every new market—every demand for new types and sizes of product—every shift in selling practice, has been anticipated and planned for in advance . . . The Servel dealer finds security in the knowledge that the line he sells today is planned for tomorrow's market—not a "Chinese copy" of yesterday's best seller.

SERVEL

COMMERCIAL REFRIGERATION

SERVEL, INC. *Commercial Refrigeration Division* EVANSVILLE, IND.

This modern 33-acre plant is the home of Servel Commercial Refrigeration and the world-famous Electrolux, the Servel Gas Refrigerator

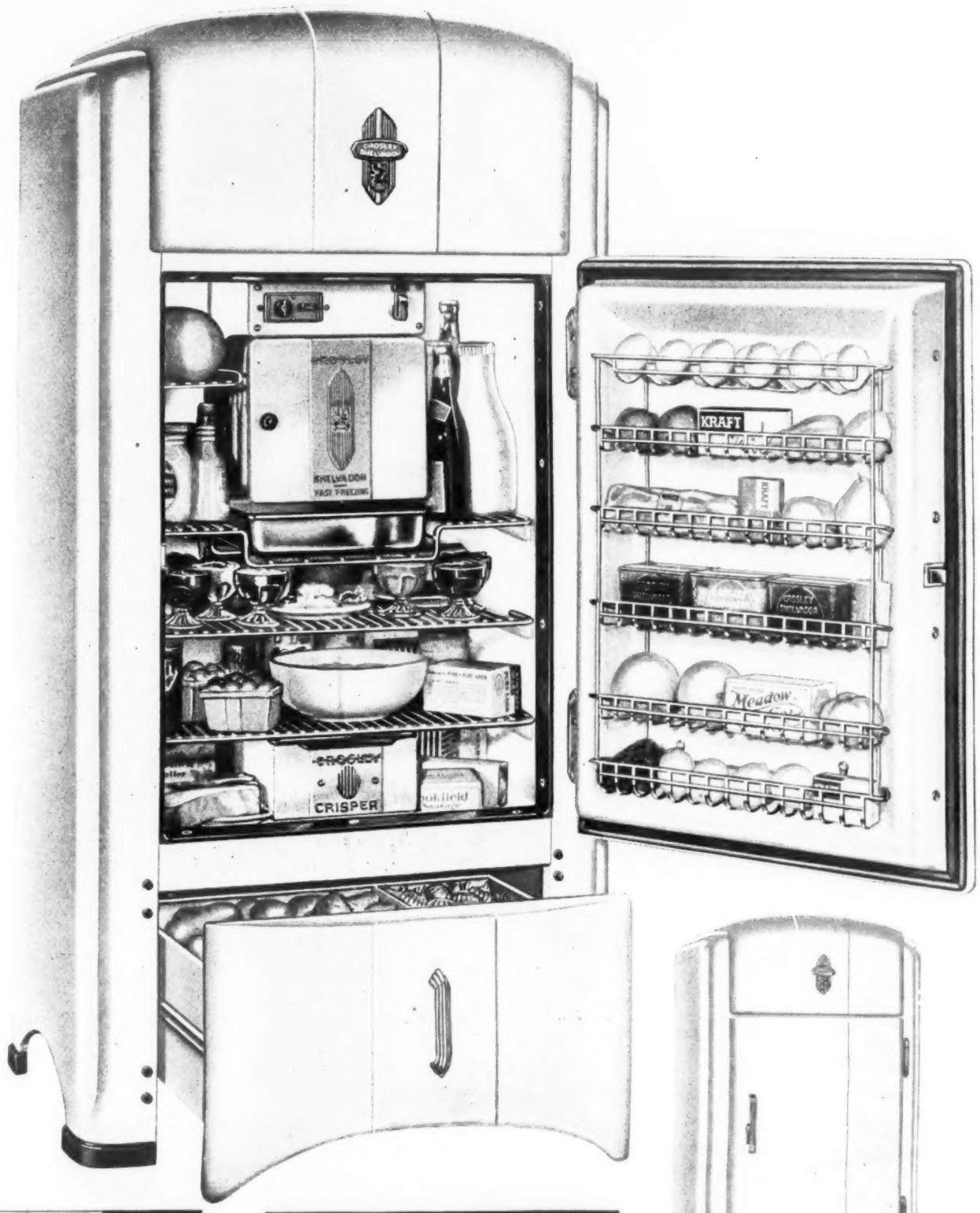


CROSLEY
FIRST and FOURTH!

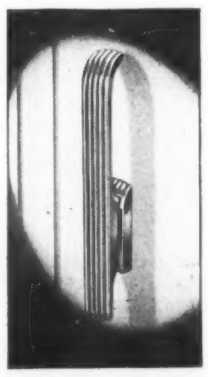
FIRST WITH THE SHELVADOR • FOURTH IN THE REFRIGERATION INDUSTRY!

First with the Shelvador . . . the exclusive Crosley feature that almost doubles the capacity of the refrigerator . . . the feature that has made the Crosley Shelvador Electric Refrigerator the stand-out value and the fastest-selling refrigerator the trade has ever known. In five years this feature has skyrocketed Crosley and the Crosley Shelvador to the commanding position of Fourth in the entire refrigeration industry. And Crosley is headed even higher in 1937, for the whole world is sold on—"*This Much More in a Shelvador . . . The World's Most Beautiful Refrigerator.*"

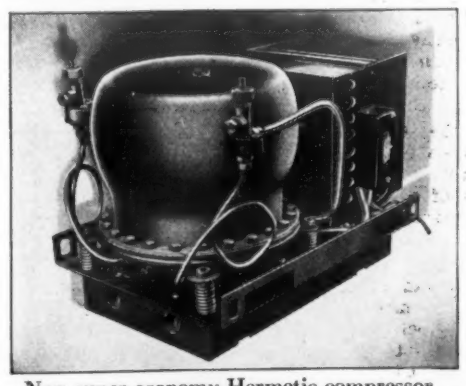
A phenomenal record, but not at all surprising to those who watched the rise of Crosley in the radio industry . . . those who knew the Crosley organization and engineering staff . . . those who were familiar with the Crosley principle behind every product: "To Build it better . . . to sell it for less." Crosley did not enter the refrigeration market until certain of an electric refrigerator that was *absolutely right* . . . in performance . . . price . . . preference. The Crosley Shelvador is all of that and more . . . it is as much at home in a palace as in a cottage. Everything is set for another "Crosley Year" in electrical refrigeration, and the dealer who expects to keep up with the parade will tie up with Crosley—and push the Shelvador. See your nearest Crosley Distributor and ask for details of the Crosley Franchise.



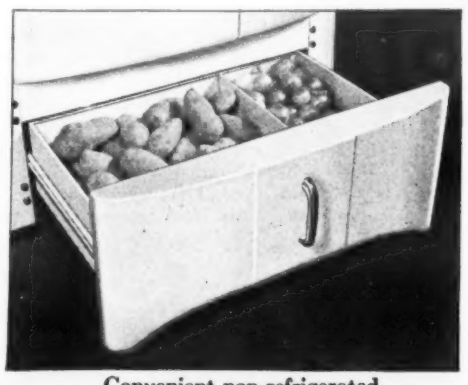
Knee-action, feather-touch door handle.



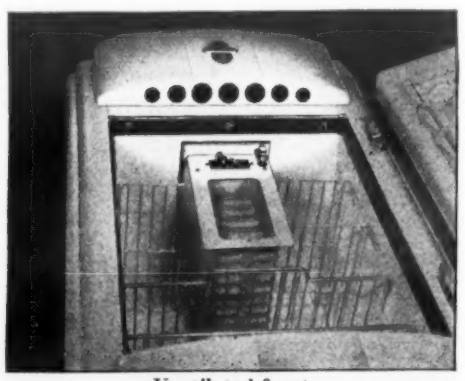
Model shown is GKQ-60 De Luxe. Capacities: Net cu. ft. 6.01; shelf area 14.37 sq. ft. Added features: Storadrawer and Crisper. Retail price: With double-belt compressor $169.95; with Hermetic Compressor (GKT-60) $184.95. Other sizes: 3 to 7 net cu. ft. Other prices from $94.50 to $204.95. Slightly higher in Florida, Rocky Mountain States and west.



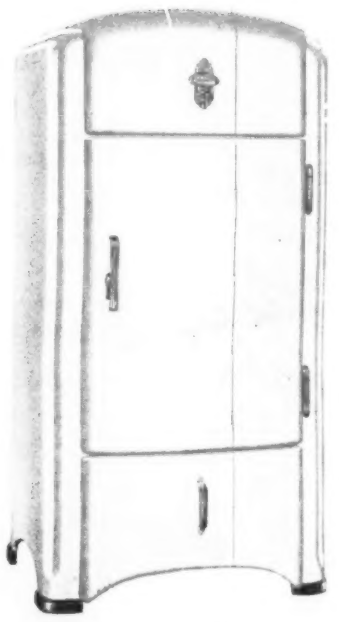
New super-economy Hermetic compressor available on most models.



Convenient non-refrigerated Storadrawer.



Ventilated front.



THE CROSLEY RADIO CORPORATION

(*Pioneer Manufacturers of Radio Receiving Sets*)

Home of "*the Nation's Station*"—WLW—most powerful in the world—70 on your dial.

POWEL CROSLEY, Jr., *President*

CINCINNATI

Around the World

With George F. Taubeneck

After taking readers with him across the United States, down through Hawaii and South Seas islands to New Zealand and Australia, up through the Dutch East Indies and Malaya, across Burma and India to Arabia, Egypt, and Palestine, and across the Mediterranean to turbulent Spain, with stops at Malta and Marseilles, the editor of AIR CONDITIONING AND REFRIGERATION NEWS is now ready to describe what he saw and explain what he learned about France and its glamorous capital, Paris.

This is the 40th instalment of Editor Taubeneck's "World Series" travelogs and surveys of foreign markets for American refrigeration and air-conditioning equipment, and home appliances. Studies of the French market, the French refrigeration industry, the people of France, and the city of Paris will be continued in the next two issues of the NEWS.

Yum, Yum!

Two weeks in Paris in the loveliest spring weather to be found anywhere is a bit of a grand experience, particularly for a rather tired young man who had just about had his fill of the "exotic East," with its dirt, smells, discomforts, steaming climate, and unpalatable food.

Food! Ah, now. Even if Paris weren't probably the most beautiful large city in the world, even if its early May hadn't been at once a tonic and a dose of soothing syrup, French cooking would have made our stay there worth recording in flaming red letters.

No matter what restaurant you may visit, be it one of the elaborate establishments with floral gardens and string orchestras, or a little hideaway nook with three red-checkerboard-clothed tables, you'll get food which is a gastronomic adventure. And you'll go away feeling that God's in his heaven and all's right with your tummy.

We won't attempt to describe the various dishes and concoctions we encountered. Fact is, at this moment, we can't even remember the component parts. The big point to French cooking is that the chefs show *imagination* in the ingredients they combine, and that the sauces which give these foods their especial savor belong to the realm of the fine arts.

What ever else the Frenchman may be, he is a post graduate student in the science of *living well.* He surrounds himself with beautiful objects, he contrives to listen to fine music every day, he clothes his women in the finest frocks and trimmest hats and sheerest stockings, he insists on his late afternoon leisure for discussion and contemplation, and he eats well—boy! how he eats!

* * *

Four Other Fellows

With all his mastery of food, however, the Frenchman might never have learned about *refrigeration* had it not been for Americans and other outsiders.

Today France is an excellent market for American refrigeration products—exceeded only by England and South Africa. Two or three years ago it was *first* among foreign markets for American refrigeration; but in the interim French manufacturers have become increasingly important in their own national picture.

Nevertheless, it was not from Frenchmen, really, that I learned about refrigeration in France. It was from four other fellows: HARRY GRANARY (General Electric), an American; EDGAR CARMEL (Frigidaire), a Canadian; Baron LUIGI PARILLI (Kelvinator), an Italian; and HARRY NOORDBERG (Melchior, Armstrong, Dessau), a Dutchman.

Each of these gentlemen is virtually the head man of all European refrigeration operations for his company. Baron Parilli and Noordberg have the title of European Manager; and whereas Granary and Carmel have no jurisdiction over European countries in which branches or affiliated companies operate (General Electric, for example, has affiliates in Germany, Spain, and Italy), the Paris office is considered the key to the continent, and the Paris manager the senior official.

Of course many other men contributed to the knowledge of the French refrigeration situation which will follow, men who will be named as the story progresses. But it is to this quartet of non-Frenchmen, perhaps, that we owe the most.

* * *

Harry Granary, Gentleman

To HARRY GRANARY, who manages General Electric refrigeration sales for most of the continent of Europe out of the Paris office, should go an especially large and fragrant bouquet. I had met him previously in New York, and took the liberty of naming his office as my European address.

Harry is an exceedingly busy fellow, yet he insisted that everything he had was mine—his office, his clerical help, his apartment, his friends, his guidance, his time, and (best of all) his knowledge.

Even more gratifying was his attitude of giving me the utmost freedom whilst offering me all this help. He and his facilities were there if I wanted them; but he scrupulously avoided monopolizing my time and attention.

Being a bachelor himself, Harry appreciates how important freedom of action and independence can be to another bachelor; and that freedom is especially dear to a *reporter* who is trying to get a complete and unbiased picture of a particular situation.

Mr. Granary was born and educated in Louisiana; but has done most of his work in foreign fields. He entered the service of the International General Electric Co. shortly after leaving college, and was sent at once to the West Indies. Later he was moved to Paris, where he has remained for many years.

He is in all respects a *gentleman;* although his competitors may tell you that he is a sharp fighter, and gets business grimly.

* * *

'The French They Are a Funny Race, Parleyvoo!'

The manufacture and sale of ice has never been much of a business in France. Even in Paris there is no delivery to homes. Big commercial users can get regular deliveries, but not households. If you really want a chunk of ice for your kitchen, you must drive 'way out to hellangone and get it yourself.

Up until the advent of the American electric refrigerator, most French housekeepers attempted to preserve their food in various types of window boxes, grouped generically under the term, *garde a manger.*

Apartment houses generally have these built in, and underneath each kitchen window you'll find vents to the outside, through which cool air—also dirt and filth—may pass into the *garde a manger.* (See pictures.)

French servants don't like to see an electric refrigerator come into the house because it cuts food bills, and they get commissions on everything they buy from stores. (Servants get their employers going and coming—commissions from shopkeepers on the one hand, a share of the food to take to their own homes on the other.)

Discounts are the bane of a dealer's existence. The French are world-famed for their thrift and niggardliness, and it's no joke, either. No Frenchman ever expects to pay the list price. He will haggle for weeks until he gets what he thinks is a flattering discount. It's a matter of pride with him.

Of course he doesn't get his refrigerators for less money than members of other races. Fact is, he's likely to pay more; for the dealer simply ups the list prices to a point high enough to take care of the discount which the most persistent haggler may succeed in obtaining. Before devaluation of the franc (at the time I was there) a 4-cu. ft. box listed at the equivalent of $255.

It's annoying, of course, to do business that way. It's even more irritating to find that the purchaser of a refrigerator will tell his friends that he paid less for it than he actually did. The French do so love to brag about the bargains they get that all too often they lie about the purchase price—which, of course, gives the next haggler a goal to work toward.

Time payment sales are gaining in popularity, although they still do not account for so heavy a proportion of the sales as in America. Customary formula is 20% down, and the balance in payments spread over 18 months or two years. The dealer must finance his own paper.

Long-term guarantees are not all-important in France either. General Electric offers a straight four-year guarantee, at the end of which two years additional are extended to the owner upon payment of 400 francs (which figure has undoubtedly been upped since the recent devaluation of the franc).

According to Mr. Granary, General Electric dealers make money on this contract for an extra two years. The French climate is mild, the servants or housewives insist on shopping for food every day and hence don't load up the refrigerators, and service troubles are relatively few.

Newspaper advertising is little used by distributors in France. Inasmuch as the papers are principally political flag-or-rag-wavers, with scant reputation for truth telling, buyers seem to attach little importance to advertisements placed therein. (The Paris edition of the *New York Herald-Tribune,* published in English, is an exception to this rule).

Best method of promotion, all distributors agree, is exhibiting at trade fairs, of which there are a number running at all times in various parts of France.

The writer went out to the Foire de Paris during his stay, and found a Little World's Fair in progress, simply crammed with refrigeratoir exhibits. These were as attractive and eye-compelling as any at A Century of Progress, Dallas Centennial, or Great Lakes Expositions, and were drawing a steady flow of prospects. (See pictures).

There are scads of French refrigeration manufacturers. They come and go with the wind, some of them eking out a living from the assembly and sale of perhaps 30 units a year! Like the Australians, the French manufacturers are rank pirates, and hesitate not at all to copy the design of any part which they may fancy on an imported unit.

In some places you hear the comment that Melchior Armstrong Dessau is "the biggest manufacturer in Europe." This is not literally true, of course, for this American exporting firm has no factory of its own. But Mr. Noordberg does supply parts and materials to a vast number of manufacturers in France and elsewhere on the Continent, which parts and materials are assembled by the local fabricators.

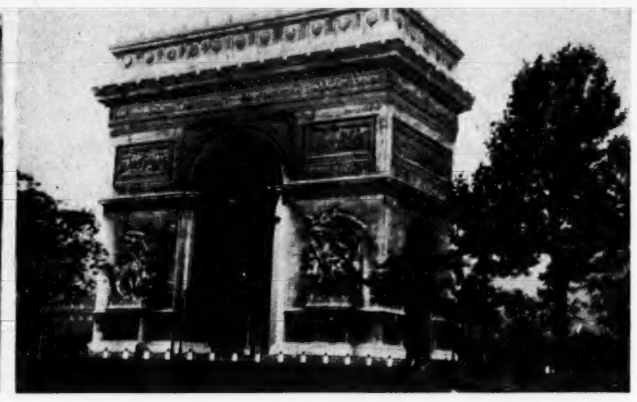
Although all of the American firms will tell you that the French make poor refrigerating machines, they do admit that the French manufacture good cabinets. Fact is, the American importers buy French cabinets themselves.

Tariffs are based on weight (so many francs per kilometer, dependent upon an intricate series of variables), and hence it becomes almost prohibitively expensive to import either commercial or household cabinets.

In Paris refrigerator users may take

(*Continued on Page 5, Column 1*)

Two Fine Sights in La Belle Paree

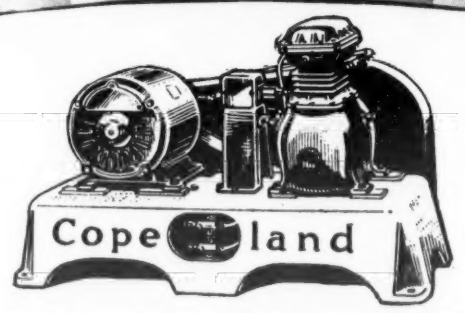


At the left, the Frigidaire showroom; at the right, the Arc de Triomphe—two of the finest sights in Paris.

COPELAND

First PRODUCT OF ITS KIND . . . 18 Years Ago!

First IN HIGH STANDARDS OF PRECISION-MANUFACTURING Today!



Copeland Commercial and Household Refrigerating Units are recognized throughout the industry for their unusually smooth performance, exceptional economy and long trouble-free operation.

● Since the earliest days of the industry, Copeland has been recognized as a superior type of electric refrigeration. Copeland was the first successful automatic electric refrigerator! Today's Copelands, both household and commercial lines, are outstanding examples of scientific manufacturing methods far beyond the usual. Copeland's large facilities, resources and long experience are concentrated upon the production of the finest electric refrigeration it is possible to manufacture.

COPELAND REFRIGERATION CORPORATION

Manufacturers of a Complete Line of Household and Commercial Refrigeration

Holden Avenue at Lincoln . . . DETROIT, MICHIGAN

(*Concluded from Page 4, Column 5*)

advantage of a special power rate for electrical current which amounts to about three cents per kilowatt. Special wiring is required on the installation in order for the user to get the benefit of this rate.

The same rate is also available to users of ranges or washing machines. Comparatively few American electric ranges are sold in France, most of this business going to French manufacturers, with German and Dutch makes runners-up.

French, German, and Dutch radios also sell well in competition with American brands.

A good market for washing machines exists, because laundry is expensive in most French cities. (The writer paid about 62 cents per shirt, 24 cents for a pair of sox).

* * *

Dat Ol'Dabbil, Quota

In order to protect French manufacturers, the government of France does not stop with fairly high tariffs. It imposes *quotas* on importers. At present, these quotas are based upon imports in 1934.

If the Paris Frigidaire organization, for example, imported so many kilograms of refrigeration equipment in 1934, it can import only a certain percentage of that amount of equipment (measured by weight) in 1936.

Now it so happens that Frigidaire and General Electric had exceedingly good years in 1934, and hence the quota restrictions don't bother these two firms much.

But concerns which happened to have an off season in 1934 fare pretty badly. And firms which had no dealer representation in France at that time, like Fairbanks Morse, are totally out-of-luck.

Some French observers are of the opinion that the government's quota decree, together with other measures apparently conceived to protect French national enterprise and industrial independence, will be made, sooner or later, into the permanent trade control structure of the country, in the hope of relieving emergency conditions and hastening permanent prosperity.

Observers are generally agreed that local independent and syndicated refrigerator firms cannot supply more than a fifth of France's annual requirements. So, most believe, the authorities should allow the issue of public health to prevail over international trade adjustments, and lift the quota restrictions.

Since American-made equipment comprises fully 70% of the imports into the country, representatives of American firms are, naturally, most concerned with having the quota restrictions lifted.

* * *

Story Behind the Quota

According to my informants, the story behind the adoption of the quota runs about as follows:

The "Chambre Syndicale des Constructeurs de Materiel Frigorifique Francais et Industries Annexes," comprising 15 enterprises representing about 30% of the French industry proper, prevailed upon the government to issue a quota decree. In so doing, the "Chambre Syndicale" acted without the authority of the group of 60 French national subsidiary enterprises representing the remaining 70%, who directly and indirectly depend on the permanently increasing imports of foreign, and especially of American, refrigerator equipment.

The government, unaware of this situation, issued the following interlocutory decree on May 15, 1935, as per publication in the *Journal Officiel*, p. 5275 of May 17, 1935:

MINISTRY OF COMMERCE AND INDUSTRY

Importation of Refrigerator Apparatus.

The President of the French Republic, in view of Article 17 of the Customs Code; on the report of the president of the council, the minister of commerce and industry, the minister of foreign affairs, and the minister of finance; the council of ministers in agreement decrees:

Art. 1. By special decree and for the time being, the importation of the goods hereinafter mentioned can only be effected according to the terms determined by interministerial decree:

Ex. No. 524 bis M.—Electrical machinery and electro-technical apparatus for domestic use, and electro-mechanical small tools: domestic refrigerator machines, scouring machines, food mixers, etc.

527 bis.—Refrigerator apparatus.

Art. 2. The president of the council, the minister of commerce and industry, the minister of foreign affairs, and the minister of finance are instructed, each in his own department, to execute the present decree.

The minister of foreign affairs, the minister of finance, the minister of commerce and industry, in view of the decree of May 15, 1935, which has determined for the present the importation of refrigerator apparatus, decree:

Art. 1.—The importation of refrigerator apparatus, revised by the decree of May 15, 1935, will only be able to be effected, until further notice, on the production of individual authorization papers of importation issued by the customs authorities according to the terms given and advised to importers.

The amount of these authorizations will be equal to the quantities which the importers can prove to have imported during the corresponding month in 1934.

Goods which can be proved to have been dispatched specifically to France prior to the date of publication of the present decree of the *Journal Officiel* will be allowed to be imported, without special authorization.

Art. 2.—The councillor of state, director of customs, is charged with the execution of this present decree.

The decree was to be applied subject to the following by-law likewise published in the same issue of the *Journal Officiel*:

NOTICE TO IMPORTERS
Importation of Refrigerator Apparatus

The importation of refrigerator machines for domestic use (Ex. No. 524 bis M) and of refrigerator apparatus (No. 527 bis) is subject to the production of special authorization papers on importation issued by the customs authorities on the proposal of the Confederation Generale de la Production Francaise, 6, rue de Messine, Paris, to whom all requests for authorization of importation should be addressed.

Goods which can be proved to have been dispatched specifically to France prior to the date of publication of the present decree in the *Journal Officiel* will be allowed to be imported without special authorization.

This established a temporary quota for refrigeration material imported into France under No. 524 bis M. and No. 527 bis of the French Customs tariff on the basis of the monthly importations of 1934.

It invited the American government to designate a committee to discuss the matter with a committee appointed by the French government. The Refrigeration Division of National Electrical Manufacturers Asscciation, at the request of United States Department of Commerce, appointed the French Nema manufacturers committee to represent the American electric refrigeration industry before the French Chambre Syndicale in all matters pertaining to this quota and any possible derivations.

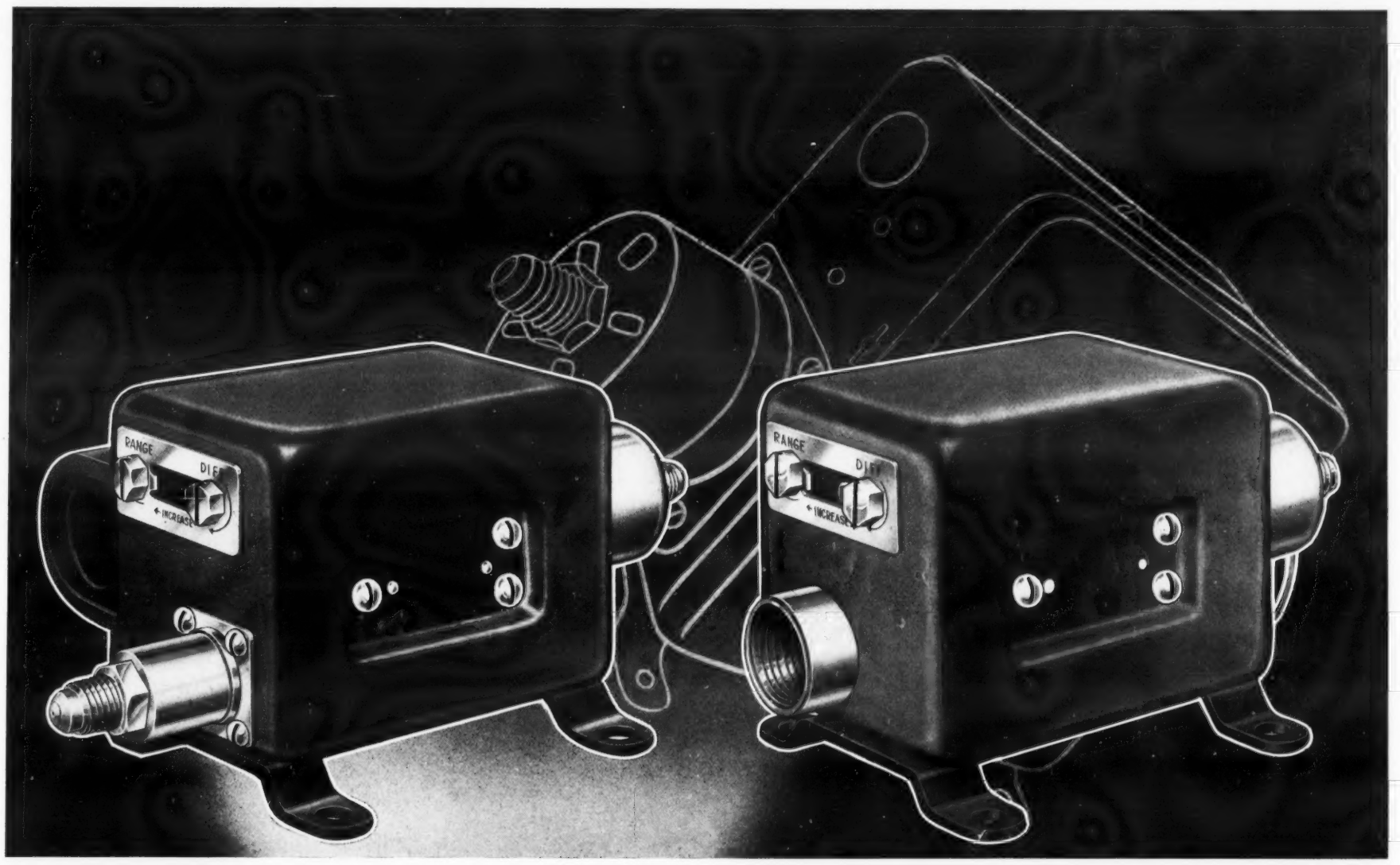
For 524 bis M. (Household cabinets), administration of the quota was placed in the hands of the "Comite Interprofessionnel des Industries Electriques" (CIIE) who delivered up to December, 1935, to the old importers monthly import licenses for quantities up to what they imported in the corresponding month of 1934. The committee obtained from the Ministry the authorization to grant to new importers—those that had not imported in 1934—import licenses up to a maximum of 5% of what had been imported in 1934, also on a monthly basis.

For 527 bis (Commercial machines), the administration of the quota was placed in the hands of the "Comite Interprofessionnel de la Mecanique" (CIM). Before granting any license, the Committee asked the Ministry for instructions regarding new importers and was told to give the old importers only 85% of what they had imported in 1934; the balance was to be used for taking care of the new importers. In case the balance was not fully taken up, the remainder was to be allocated on a pro rata basis to the old importers. The CIM, up to December, 1935, granted monthly and individual licenses according to these instructions.

A series of conferences was held during 1935, and efforts were made by the American importers' group to arrive at a permanent understanding with the French Syndicate in the direction of a joint working arrangement which would guarantee to the members of the French Syndicate a steadily increasing share in the business and, on the other hand, would not jeopardize the heavy pioneer investment made in this market by the American importers and would not deprive this market of their intrepid scientific promotional sales activities and the annually recurrent propaganda disbursements aggregating for this group roughly 5 million francs.

The suggestions of this group seemed to meet with a favorable reception by the representatives of the French Syndicate. A general plan was outlined which would bring the importers and the French group together in a joint organization representing not less than 75% of the French market, to which the government's sponsorship was to have been invited.

(The discussion of the French quota system will be continued next week.)



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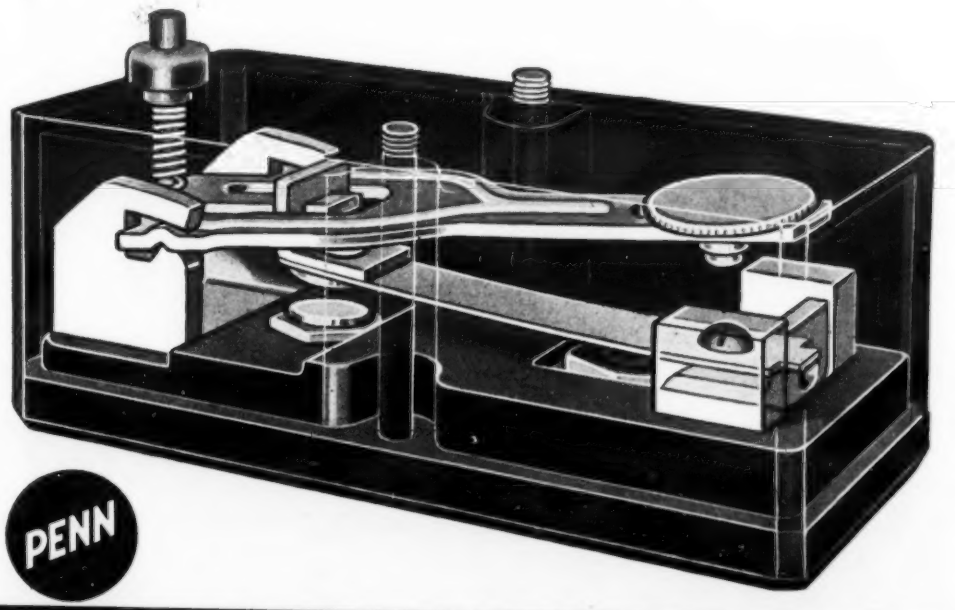

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EXPORT: New York DISTRIBUTORS in all principal cities

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History of Refrigeration Before 1890 Records Founding of Companies Active Today

Frick, Vilter, York, and DeLaVergne Active in Development of Industry in Early Period

By Edgar R. Curry, Managing Editor, Ice and Refrigeration

Within the time of the present generation the entire industry of refrigeration has grown from a crude experimental stage to its present size. Yet the idea itself is centuries old.

The first artificial refrigeration that we know of was snow, used during the time of the Roman Empire.

The first ice house in the United States was erected on the Hudson river near New York City in 1798. The first shipment of ice was made in 1799 from New York to Charleston, S. C., by boat.

Frederick Tudor of Boston was the first big ice man, developing his natural ice business to a considerable size.

As far back as 1607 various frigorific mixtures were used to produce artificial cold, the most common being salt and ice. This was employed by Fahrenheit in 1762 when he placed the freezing point of water at 32° F.

Dr. Cullen Invented First Mechanical Unit in 1755

The first machine to produce ice by purely mechanical means was invented by Dr. William Cullen in 1755. He reduced atmospheric pressure with an air pump, the evaporation of the water being so increased as to produce freezing temperatures.

This was the pioneer ice machine, not only of the vacuum type but of any kind, and mechanical refrigeration may be said to have originated with this device.

A few years later the affinity of sulphuric acid for water was discovered and in 1810 Leslie had made ice through this agency.

In the meantime the Royal Institute of England was founded in 1799 and in the early twenties Humphrey Davy and Michael Faraday had demonstrated that gases could be liquefied by mechanical compression with continuous cooling apparatus to carry away the heat.

Volatile freezing mixtures also were used with vacuum compound and mechanical pressure.

In 1824 Vallance of France obtained patents in Great Britain for refrigerating with sulphuric acid. He is said to have obtained his idea from the evaporating system used in India. His method coated leaden balls with sulphuric acid to increase the absorbing efficiency.

Perkins Credited with First Production of Commercial Ice

Jacob Perkins, an American engineer living in London, is given credit for inventing the first machine capable of producing ice in commercial quantities. It was the forerunner of the modern compression apparatus.

His patent was obtained in August, 1834, with ether as the refrigerant. The evaporator containing the ether enclosed a system of pipes through which brine at 5° F. was circulated. The brine then passed into a long receptacle containing boxes filled with water.

Having frozen their contents, the brine was pumped back again to be subjected to the refrigerating effect of the expanding ether. Thus the cycle was completed and the principle established upon which modern refrigerating machines are founded—the brine or indirect system.

This patent was substantially improved by Harrison of Australia in 1856 and brought into practical use in the refrigeration of breweries and food products.

Experimental Work Done by Prof. Twining and Dr. Gorrie

Prof. A. C. Twining, of New Haven, Conn., was the next practical inventor of an ice making machine. Dr. John Gorrie of Apalachicola, Fla., had been experimenting for a number of years with cold air apparatus, but without effecting a practical apparatus. Twining, after experimenting since 1848 with sulphuric ether as a refrigerant was granted a patent in England in July, 1860, and by the United States Patent Office in November, 1853.

This apparatus comprised a double acting vacuum and compression pump. The pump discharged into a tubular condenser in which the ether was retained in liquid form by the pressure and cooling effect of the water flowing through it.

The liquid ether passed into a cistern where it expanded into a gas, absorbing heat in the process. The cistern contained a number of cells open at the top and filled with a liquid that would not freeze at ordinary temperatures. In this liquid iron molds filled with water were immersed and the contents frozen into ice cakes.

It was this style of machine that Twining is said to have had in operation in Cleveland about 1855, which produced ice at rate of 1,600 lbs. in twenty-four hours.

Dr. John Gorrie of Apalachicola, Fla., received the first patent in America for the manufacture of ice by mechanical operation. As early as 1845, he had experimented with cold air machines for use in sick rooms and for treating fevers.

His machine had a compression cylinder from which the air passed into a cooling chamber immersed in water. The patent was issued on May 6, 1851, but was retroactive to August 22, 1850. Apparently Dr. Gorrie made a small quantity of ice with a model machine at an Apalachicola hotel about this time. This undoubtedly was the forerunner of the compressed air machine, later improved upon by Dr. Alexander Kirk and others. Dr. Gorrie died June 16, 1855.

Australian Perfected Perkins Machine

About this time Dr. James Harrison, of Geelong, Victoria, Australia, started work on a sulphuric ether refrigerating machine. His procedure was an improvement on the Perkins apparatus of 1834.

After many delays he ordered two machines constructed by P. N. Russell & Co. of Sydney in August, 1859. These machines were of the table engine type and geared direct to a steam engine table.

In that year and the next several ice machines were in operation in Sydney, and in 1860 the brewing firm of Glasgow & Thunder, of Bendigo, Victoria, installed a refrigerating apparatus of the Harrison type.

About this time Harrison commenced to experiment with the refrigeration of meats. He sent a large quantity on the sailing vessel "Norfolk" from Melbourne to London, but the artificial ice did not last and the meat had to be thrown overboard.

Although the value of his work is now generally recognized, Dr. Harrison's name has not been honored so widely as that of Dr. Gorrie.

Carre Set Basis for Ammonia Absorption Machines

Edmund Carre so improved the Vallance machine that in the early fifties it was making ices and cooled drinks in the Parisian cafes.

It was his brother, Ferdinand E. P. Carre who in 1858-60 placed on the market a machine which established the basis of the ammonia absorption system of today.

The original machine was very crude, consisting of two vessels, one surrounded by cold water, the other containing ammonia and water.

Introduction of the Carre machine, subsequently improved by Mignon and Rouart in France; Vass and Littmann in Germany; Reece, Mort, Nicolle and others in England and Australia, marked an important era in mechanical refrigeration.

The original patent in the United States was issued October 2, 1860, and reissued February 18, 1873. This invention made use of the ability of cold water to absorb a large quantity of ammonia gas and to release this gas under pressure when heated.

The Carre ammonia absorption system established the frozen meat trade which has been of such benefit to Great Britain and to the world. In 1860 Augustus Morris of Sydney, N. S. W., conceived the idea of shipping frozen beef, and offered $1,000 with which engineers and practical men might experiment along those lines.

Mort Financed Experiments For Storage of Frozen Meats

From 1861 to 1870 Thomas S. Mort, a wealthy merchant of Sydney, carried on experimental work at a cost of fully $1,000,000. He went to Great Britain to investigate the system of Reece, an improvement of the Carre absorption apparatus.

In association with E. D. Nicolle, a well known mechanical engineer, he took out a number of patents for improvements on the original absorption machine, at the same time conducting many experiments with air compression machines.

In 1861 Mort founded the Fresh Food & Ice Co. of New South Wales for the purpose of supplying Australian cities with fresh meat, and of exporting it to England. His slaughtering and chilling works were erected about 96 miles from Sydney.

He did not overstate the fact when in his opening speech he prophesied as the ultimate outcome of the frozen meat trade that "the half-starved nations of the earth shall now be fed."

After experimenting with absorption machines, Mort and Nicolle turned their attention to the use of nitrate of ammonia as a refrigerating agent. They took out a patent in 1873 insuring continuity of action and utilizing the low temperature of the spent liquor.

A number of small household machines were made and used in Sydney, and some thousands of pounds were spent in fitting up the ship "Northam" to take to England a cargo of meat frozen on this principle.

Certain iron parts were attacked by acid set free in the refrigerating process before the vessel left the wharf, and the project had to be abandoned. Although this experiment was a failure, it marks an epoch in the history of mechanical refrigeration.

Mort died soon after this mishap, without seeing the realization of the scheme which he had cherished for years. It is said he spent more than £100,000 on ice making machinery before he received the return of a single shilling.

The Carre machines were not the first to obtain a foothold in the ice-making industry in the United States.

War Gave Impetus to Ice Manufacture in South

The Civil War in 1861-5 interrupted the shipments of natural ice to the South and they were never again resumed in full. In 1863 Mr. Bujac of New Orleans shipped through the blockade to Augusta, Ga., a small Carre machine with a supposed capacity of 500 lbs. per day.

The machine was not a success chiefly because of the parties who had charge of it.

In 1868 Sylvester Bennett installed six 10-ton Carre absorption ice-making machines at Gretna, opposite New Orleans, for the Louisiana Ice Co., from plans furnished by Carre. The ice was not clear, nor solid, and the public did not take to it.

The company employed a chemist to diagnose the trouble and he advised boiling the water before freezing. This was done and it was successful.

Other experiments were made by Wm. Golding, an engineer of New Orleans, the object of which was to compress 25-lb. blocks of ice into a solid one of 100 lbs. by means of a hydraulic press. The ice, instead of being transparent, became opaque and this experiment was abandoned.

The next step was to make a 1,500-lb. block of ice from distilled water. It was frozen solid in about 72 hours, clear and entirely free from air bubbles. This process was used for a time.

Shortly after the installation of the Carre machine in New Orleans in 1868, Charles Tellier of Passy, near Paris, took out patents on his compression apparatus. The refrigerating agent was methylic ether.

In 1869 George Merz, a New Orleans brewer, installed one of these machines for the purpose of making ale and lager beer without ice. It was designed for ether, but ammonia was used; hence it did not work well and was finally discarded.

But a start had been made toward using artificial refrigeration in American breweries.

It was a Tellier apparatus with methylic ether as a refrigerant, that brought the first cargo of fresh meat safely through the tropics to Rouen, France, in 1876.

Postle Invention Improved By Bell-Coleman

In July, 1868, J. D. Postle patented an apparatus for producing cold by the expansion of compressed air, which was subsequently greatly improved by Bell-Coleman, Hall, Gifford, Lightfoot, and other English and Australian inventors. This system was used for many years in early steamship refrigeration.

In September, 1869, in April, 1870, and at various later dates, Daniel L. Holden obtained patents on his refrigerating apparatus.

This machine, the culmination of 25 years experimentation, formed ice on the outer surface of a revolving cylinder, from which it was removed by a scraper.

The resulting flakes were compressed into cakes. The apparatus was designed to use either the compression or the absorption system.

John M. Beath was another early and practical American inventor of ice-making machinery. With Samuel B. Martin, he constructed an ice plant in 1869 at Los Angeles, Calif., and in 1870 and 1871 at San Francisco and Portland, Ore.

These plant were operated by compression machines. Ice in the first two was made by the plate method, and in the last by sprinkling water upon freezing surfaces. The first patent was granted to Beath and Martin as joint inventors in 1872.

In these early times there were many experimenters in the United States whose patents were not productive of practical results. Daniel E. Somes of Washington was one of the most prolific, his inventions including the cooling and ventilating of ships (1865).

He evidently was of an active though over-visionary turn of mind, and at one time tried to get a bill through Congress providing for the drawing of cold air from the clouds and forcing it into the Capital.

T. S. C. Lowe of balloon and gas fame, who long experimented with liquid carbonic acid gas, received his first patent on an ice machine in 1867, erected it about 1869 at Jackson, Miss., and attemted to carry beef from Texas in a ship refrigerated with gas. His attempts were generally unsuccessful.

Compression Machine Gets Attention in Seventies

In the seventies, the so-called dense air or compression machine monopolized to a great extent the attention of both inventors and the commercial world of refrigeration.

Franz Windhausen of Brunswick, Germany, was the first exponent in this field and his machines were installed in German and American breweries and in English dairies.

The original patent was issued in the United States March 22, 1870. It was a freezing and ice making machine in which atmospheric air was compressed, then passed through a cooler and afterward expanded to remove the heat.

Among the first establishments in which the Windhausen machines were installed in United States was the brewery of Christian Moerlein of Cincinnati, in 1875. Windhausen patented his vacuum machine in Germany in 1877 and subsequently in France, England, Austria, Spain, Belgium, and the United States.

In 1878 he invented his combined vacuum pump for producing ice on a large scale and so improved it in 1881 that his machine would produce 15 tons of ice in 24 hours, considered remarkable then.

Linde Considered Leader In Compression Field

A few years later (1873-75), another German inventor, Prof. C. P. G. Linde, of Munich, introduced his ammonia refrigerating machine. He is now considered the foremost exponent of the compression system.

Linde patented his machine in the United States in 1880, assigning his rights to Fred W. Wolf, and it was manufactured by the Fred W. Wolf Co. of Chicago for many years.

The first Linde machine in the United States was erected in the brewery of the Wacker & Burk Brewing & Malting Co. of Chicago in 1880.

Raoul P. Pictet, professor of physics in the University of Geneva, Switzerland, had been experimenting with the liquefaction of gases and refrigerating apparatus for several years prior to taking out his first patent in the United States in February, 1877.

In this machine anhydrous sulphuric oxide was used as the refrigerating agent. The use of this refrigerant was an innovation which caused widespread comment. Among scientists Pictet is associated with the founding of the so-called system of cooling cycles, the basis of all successful modern refrigeration.

A number of Pictet machines were installed for various purposes in 1876 and 1877, in breweries, soap and candle factories, and in frozen meats and ice plants.

One of the earliest inventors and builders of refrigerating machinery in the United States was Thomas L. Rankin, a native of Ohio, whose early experiments were conducted in the South. His first patent was issued March 28, 1876, and for a period of 10 years he received a number of additional patents.

His machines were of the absorption type and were used in many breweries. The first brewery to be equipped with this type machine was Jacob Ruppert's plant in New York City in 1879.

Boyle Started Own Company In Chicago in 1878

David Boyle, a Scotchman and a close associate of Daniel L. Holden, Thomas L. Rankin and other pioneers, made a practical success of his invention.

From 1875 to 1878 Boyle was associated with W. B. Buchnell of Quincy, Ill., building ice making and refrigerating machinery and apparatus in Chicago.

In 1878 the Boyle Ice Machine Co. was incorporated in Chicago, and built a large number of ice making and refrigerating machines. It was later consolidated with the Empire Machine Co. of St. Louis, and then after other changes, was finally absorbed by the Featherstone Foundry & Machine Co.

Boyle did perhaps more than any other man to develop the type of

(*Continued on Page 7, Column 1*)

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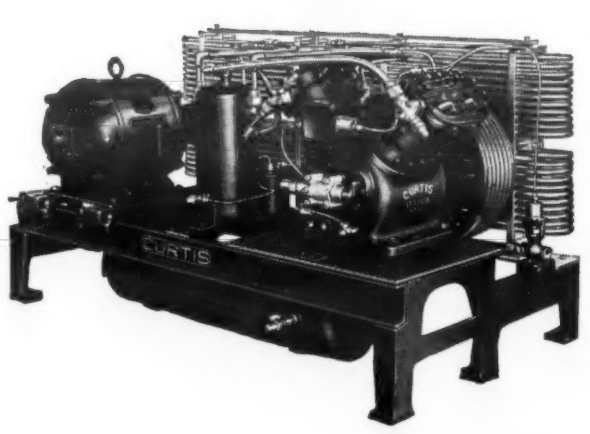

CURTIS CURTIS REFRIGERATING MACHINE CO.
Division of Curtis Manufacturing Co.
1912 Kienlen Avenue - - - - Saint Louis, Missouri

Development of Refrigeration Industry Summarized for Period Before 1890

(*Continued from Page 6, Column 5*)

apparatus known as the compression ammonia machine.

McMillan & Merchant Perfect Anhydrous Ammonia

In 1876 F. M. McMillan and Silas Merchant founded the firm of F. M. McMillan & Co. in Cleveland for the purpose of manufacturing and selling ice making machines. They employed John Enright as their supervising engineer. Their machine had a single acting compressor.

A plate ice plant built for Senator Jones of Nevada was one of the first plants to use their machine, the intention being to freeze a plate 12 in. thick, 12 ft. high, and 40 ft. long—probably the largest plates ever conceived. The ice was loosened with ammonia gas and the blocks cut up by vertical saws.

Several similar machines were built that year. In 1877 Enright designed and built a machine having a vertical double acting compressor, and in the fall of that year one of this type was installed in the brewery of A. Ziegele of Buffalo, N. Y.

In 1878 patents were issued to the inventor for this double acting compressor and for the pipe joint commonly known as the Arctic.

In 1878 the Arctic Ice Machine Manufacturing Co. was incorporated and absorbed this firm.

To this company must be accorded priority in the preparation of anhydrous ammonia and in placing it upon the market as a commercial article. It was the first also to use wrought iron cylinders instead of cast iron drums for the transportation of ammonia.

With the organization of the Arctic Company, Mr. Merchant withdrew from the partnership, although he made a few machines under the trade name of "Zero."

Bell-Coleman Unit Used in Cooling Shipload of Meat

The Bell-Coleman cold air machine which been introduced in 1877 cooled the air in and leaving the compressor, by jets of water which dried the air before it passed into the expansion cylinder.

This drying was accomplished by causing the air to flow through a set of coils in the chamber which were cooled by the machine or by exposure to a current of spent air passing out of the chamber.

In 1880 Norman Selfe of Australia obtained one of these machines, designing with it a small apparatus for bacon curing. The first cargo of frozen meat shipped from Australia to England, in the *"Strathleven"* in 1880, was cold-stored by a Bell-Coleman air machine.

Smith Sells Patent Rights Of Plate System to Frick

Captain David Smith, inventor of the plate system of ice making, was a native of Massachusetts.

He built his first machine at San Francisco in 1872, a one-ton can ice machine. This he took to Honolulu and, having trouble in confining the ammonia, he put the ammonia pipes inside a large box, on which a patent was issued in 1876.

He was the first to freeze water on the outside of a congealing box with a coil of pipe immersed in brine; in other words, the plate system of making ice. After obtaining this patent Smith sold his business in Honolulu and organized a company in Oakland, Calif., which built a five-ton plant, the first plate machine ever constructed.

A year or two later he disposed of his patent rights west of the Rocky Mountains, returned to his home in Massachusetts, and late in the eighties disposed of the balance of his patent rights to the Frick Co., of Waynesboro, Pa.

The manufacture of these machines for many years constituted an important part of the business of the refrigerating machinery department of that company.

Charles J. Ball installed his first absorption ice making machine in 1878 at Sherman, Texas, at a cost of about $12,000. It was a modified Carre, the ice tank being 8 ft. square and the cans made of galvanized iron and copper. The machine made about five tons of ice daily with one ton of coal.

The ice machine business established by Mr. Ball was carried forward by his son in St. Louis, the business now being known as the Ball Ice Machine Co.

DeLaVergne Placed First Machine in Use in 1879

The first DeLaVergne refrigerating machine was placed in operation in 1879. The inventor, John C. DeLaVergne, had been engaged in the produce business and later with the brewing industry.

In 1881 he formed the DeLaVergne Refrigerating Machine Co., with works in New York City, for the manufacture of the so-called DeLaVergne-Mixer machine, the second named patentee being William M. Mixer of New York.

The improvement of this patent over other refrigerating machinery based upon the compression and expansion of ammonia, were the effective means adopted for sealing the valves and joints and lubricating the internal mechanism of the compressor.

DeLaVergne died in 1896, but the business was carried on and is now a division of the Baldwin-Southwark Corp. of Philadelphia.

Frick Co. Refrigeration Dept. Started in 1881

The refrigerating department of the Frick Co. originated about 1881 when Jarman or Ferguson of Baltimore, Md., submitted plans of machinery to George Frick, and plants subsequently were erected for several parties in that city.

For several years following, Ferguson worked on a new design for a compressor, the plans of which were also shown to Mr. Frick. The idea was to construct an ammonia cylinder to be used as a refrigerating machine.

The Frick Co. constructed a few of these machines for Ferguson and then commenced manufacture for themselves. The first of their machines was placed in the brewery of Henry Werner of Baltimore, and was still in use after 1900.

Vilter and Weisel Made Horizontal Machine

About 1882 Peter Weisel, the founder of the business now conducted by the Vilter Manufacturing Co. of Milwaukee, Wis., designed a double acting horizontal refrigerating machine which Weisel and Vilter commenced to build in that year. The first machine was installed in the Cream City Brewery at Milwaukee.

In 1885 W. G. Lock, an engineer of Sydney, Australia, patented a compound compressor for ammonia consisting of two single-acting high pressure pumps side by side. Patents covering the idea were issued as early as 1867.

York Manufactured St. Clair Compound Machine

This machine together with a St. Clair compound machine was manufactured by the York Manufacturing Co., York, Pa. The St. Clair patent was issued in 1892. Thomas Shipley, who for a number of years was president of the company and who died in 1930, made a number of important changes and improvements in this machine.

The president of the company now is William Shipley, brother of Thomas. The name of the company was changed in 1927 to York Ice Machinery Corp.

In March, 1879, Larkin & Scheffer of St. Louis started an experimental compressor to liquefy and ship anhydrous ammonia in suitable containers.

In 1880 the Millinckrodt Chemical Works of St. Louis founded a plant for the manufacture of anhydrous ammonia.

These were the forerunners of similar plants afterward established in various parts of the United States.

The decade from 1880 to 1890 marked considerable activity in the production of new apparatus. Among other American inventors of refrigerating machinery to whom patents were issued during this period were Thomas L. Rankin, Cassius C. Palmer, Thomas Cook, Charles G. Mayer, George W. Stevens, Richard Thoens, Victor H. Becker, John Ring, A. F. Ballantine, and H. D. Stratton.

Original impetus to the manufacture of ice in the United States was brought about by embargoes on shipments of natural ice to the South during the Civil War.

Soon thereafter the manufacture of ice was begun in that section, spreading to the North, but did not assume large proportions until 1880-1890, receiving another let-up in the ice crop failure of 1890. From that time on its progress was rapid.

Col. Rushton Late Pioneer In Southern Ice Making

Among the later pioneers in commercial ice manufacture were Col. Wm. J. Rushton of Birmingham, Ala. Col. Rushton constructed a 3-ton plant at Columbia, Tenn. in 1880. Estimated at $6,500, it cost $10,000 before it finally went in operation.

In 1881 he established the Rushton Ice & Cold Storage Co. at Birmingham, Ala. In 1916 this plant had a capacity of 700 tons of ice and a cold storage plant of over 500,000 cu. ft. storage capacity.

In 1883, according to Col. Rushton, the whole South began erecting ice plants. Lack of sales in the beginning and at the end of the season, combined with a desire to get rid of the perishable product, caused manufacturers to offer cut rates to towns beyond their regular shipping points.

The trade became so demoralized that all parties were complaining. A suggestion that the ones concerned meet and discuss the situation resulted in the formation of the Southern Ice Exchange at Chattanooga, Tenn., in 1890.

This significant step gives an indication of the importance of the business, as well as the mechanical or production side of the industry, a trend that was to become much more noticeable in later years.

The basic principles of refrigeration and ice making had been established, and by 1890 a large number of ice making and refrigerating machines were in practical operation.

The field for mechanical refrigeration however, in comparison with its later development, was still small. In that year there were perhaps 1500 individual operators of refrigerating and ice making plants in the United States.

• • •

(*Editor's Note*: Part II of Mr. Curry's resume of the early history of the refrigeration industry, covering the period from 1890 to 1916, will be published in a later issue, probably the Product Development Number, Nov. 4. It deals with the development of "big machine" equipment for ice making and industrial purposes).

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AUSTRALIA REPRESENTATIVES
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Kelvinator Experiments Began In 1914; Its First Units Were Sold in 1918

Antecedents of the Kelvinator Corp., Detroit, extend back to several years before the World War when three Detroit men—Nathaniel B. Wales, A. H. Goss, and E. J. Copeland—began a series of experiments in mechanical refrigeration in a small second-story workshop on Franklin street.

Mr. Wales, an M. I. T. graduate and a well-known mechanical engineer, had been interested since his college days in developing a household refrigerator which would produce its own ice. Mr. Goss, who supplied the capital for the venture, and Mr. Copeland became interested in the idea and joined Mr. Wales in his experiments.

Started with Absorption Type

The three men entered into a contract for the promotion and development of an absorption type of refrigerating machine. They began experimentation with anhydrous ammonia, soon found to be undesirable because it required heavy pressure to effect condensing. It proved also to be a suffocating gas, dangerous for practical purposes.

Another method—compressing air and discharging it into a tank in the ice compartment of a refrigerator—was found to require a unit which, to obtain sufficient compression of air, was too large and cumbersome to be desirable.

Sulphur Dioxide Adopted

Sulphur dioxide finally was tried as a refrigerant, and Messers Wales, Goss, and Copeland found that the low working pressure and non-poisonous, non-inflammable, and non-explosive qualities of this chemical made it desirable for their purposes.

Completion of this first sulphur dioxide machine brought into being a device that was fundamentally automatic in operation.

To it was given the name "Kelvinator" in honor of Lord Kelvin (1824-1907), the distinguished Scottish physicist, whose discoveries concerning the laws of heat transference gave the refrigeration principle to the world.

Birth of Word 'Kelvinator'

The name "Kelvinator" was suggested by Stanley Reason of J. Walter Thompson Co. (advertising agency) and J. Kemphert, editor of *Popular Science Monthly.*

None of the machines produced by this pioneering triumvirate were sold until early in 1918. Many, however, were installed experimentally in private residences in and about Detroit. These private installations were watched carefully, for several problems remained to be solved.

One was the matter of automatic control. Another was the matter of gas leakage. Both of these difficulties were surmounted in 1917 and the promoters opened a sales office in Detroit in the spring of 1918.

Organized Electro-Automatic Co.

Goss and Copeland on May 13, 1916, had organized the Electro-Automatic Refrigerating Co., and incorporated it under the laws of Michigan to promote the refrigeration developments that previously had taken place and those that were contemplated.

Copeland was elected president, Goss vice president and W. T. Utley secretary-treasurer. On July 28, 1916 the name of Electric-Automatic Refrigerating Co. was changed to Kelvinator Co. and on Sept. 24, 1917, the Kelvinator Corp. of Delaware was organized.

To this new group, the Electro-Automatic Refrigerating Co. was sold on August 18, 1918. Kelvinator Corp. of Delaware was reorganized as Kelvinator Corp. of Michigan on Dec. 23, 1924.

Other Changes of Names

The year 1926 was one of great physical expansion for Kelvinator, involving also the changing of the company's name to Electric Refrigeration Corp. The name "Kelvinator Corporation" was taken back in October, 1928, and has been used ever since.

Wales remained with the company as an engineer and designer from 1914 to 1916. Copeland remained until 1921 and held several executive positions during his seven years of service, in addition to directing much of the engineering work. Goss continued with Kelvinator until 1929, and was a director until Dec. 5, 1932.

67 Units Sold First Year

After sales were begun in 1918 the progress of Kelvinator was rapid. Sixty-seven units were sold in that year, and by the end of 1920 there were 600 Kelvinators operating in homes in Detroit and vicinity.

National and international distribution had begun in earnest. At this time, all of the installations were of the "remote" type, with the condensing mechanism usually located in the basement and the cooling unit operating in the ice compartment of the refrigerator.

First Self-Contained Unit

In 1925 Kelvinator brought out its first self-contained unit.

Kelvinator sales increased by approximately 100 per cent annually for several years, but with the advent of the self-contained unit, sales skyrocketed.

By 1929 annual shipments had passed the 100,000 mark, and five years later this record was more than doubled. In 1935, shipments totaled 240,340.

Physically, Kelvinator kept pace with its rise in other lines. When work was begun in 1914, a small second-story workshop on Franklin street, Detroit, sufficed.

The organization quickly outgrew these humble surroundings, and took over factories in other parts of the city, including one on Fort street, which later was greatly expanded and is used now as service headquarters.

Today Kelvinator products are manufactured in four huge factories in Detroit, Grand Rapids, London, Ontario, and London, England. The main Detroit plant is located on a 30-acre site on Plymouth Road.

Here a building 640 feet long by 440 feet, with a floor area of approximately 690,000 square feet, houses one of the most completely equipped manufacturing plants in the world, with four miles of conveyor lines.

There is a separate boiler house with ultimate capacity of 3,000 horsepower, and a four-story administration building.

The Grand Rapids plant, which houses the manufacture of cabinets and porcelaining, consists of four concrete buildings, and has a total floor area of approximately a million square feet, with a power plant of 1,500 horsepower.

The structure occupies about nine acres of a 24-acre site, the balance being used for storage yards and shipping facilities. The Grand Rapids plant includes the world's largest and most thoroughly modern porcelain factory.

Officers and Their Backgrounds

Officers of the company are: George W. Mason, president and chairman of the board; Harold G. Perkins, vice president; Henry W. Burritt, vice president in charge of sales.

Howard A. Lewis, treasurer; Merlin Wiley, secretary; Gilbert V. Egan, assistant secretary and assistant treasurer; William R. Crossett, comptroller.

Mr. Mason came to Kelvinator in December, 1928, from Copeland Products, Inc., where he was president and general manager; before that he was works manager for Chrysler.

Mr. Perkins, who functions as a general executive and assistant to Mr. Mason, was elected Jan. 15, 1934, and before that was assistant to the president.

Mr. Burritt, before becoming associated with Kelvinator, was for several years connected with the Ford Motor Co. and with the Gray Motor Co.

Mr. Lewis was formerly with the Hotpoint company, Chicago, and the McGraw-Hill Publishing Co. He become identified with Kelvinator in 1926, and is supervisor of the export division was well as managing director of Kelvinator of Canada, Ltd., and Kelvinator, Ltd., of England.

Mr. Wiley is a partner in the law firm of Wiley, Streeter, Smith & Ford, of Detroit, and functions as counsel for Kelvinator as well as secretary.

Mr. Egan has been with Kelvinator since 1927, having served previously as treasurer of the Commercial Credit Trust of Chicago.

Mr. Crossett, before joining the Kelvinator organization had had twenty years of experience with the U. S. Steel Corp. and came to Kelvinator directly from the Canadian Steel Corp., where he was auditor and assistant treasurer.

Company's Financial History

No more convincing evidence of Kelvinator's growth since 1929, after Mr. Mason took over the helm of the corporation, may be given than that seen in the company's financial history as told in the table above.

Kelvinator added extensively to its lines since it first began operation with the manufacture of a domestic refrigerator. It now manufactures not only domestic refrigerators, but refrigeration equipment for commercial uses and air conditioning equipment. The Kelvinator line of household refrigerators covers a range of seventeen models.

Commercial Equipment

Its commercial refrigerating equipment includes ice cream cabinets, water coolers, milk coolers, beer coolers and commercial installations for food stores, florists and other businesses requiring refrigeration, as well as air conditioning.

In 1932 the company began production of oil-burning heating equipment under patents of the Rightway Oil Burner, which it acquired from the Maise Corp. Subsequently a gun-type burner was developed and marketed under the Kelvinator name.

In 1934 a combination boiler-burner model was added to the line, and in 1935 it undertook the merchandising of electric ranges under the Kelvinator trade name.

Recently announcement was made of the addition of an electric washing machine and an electric ironer to the Kelvinator line. Production plans are being arranged to put the new products on the market early in 1937.

World-Wide Distribution

Kelvinator's distribution is world-wide. The company has approximately 200 distributor and 5,500 dealer outlets as well as 143 foreign outlets covering practically every country in the world. Operations in Canada and England are through subsidiaries.

Kelvinator sales and service branches are maintained in Detroit, Boston, Buffalo and New York City. Kelvinator offices for the direction of commercial sales are maintained in Cincinnati, Dallas, Chicago, New York and Syracuse.

Offices for the direction of sales to national users are located in Los Angeles, St. Louis, Minneapolis, Boston, New York, Atlanta, Detroit, Chicago and Seattle. These offices also handle sales of equipment to ice cream manufacturers.

Temperature Research Foundation

The Temperature Research Foundation established by Kelvinator last spring was created by the company as a clearing house for authoritative information on the practical and scientific aspects of electric refrigeration, air conditioning, heating, and cooking.

Through a broad educational program, the Foundation directs public attention to the importance of temperature engineering in modern life.

Statistics Show Kelvinator Development

	1929	1930	1931	1932	1933	1934	1935
Cash	$ 550,498	$ 1,561,866	$ 3,051,989	$ 3,421,112	$ 4,367,221	$ 2,288,240	$ 2,474,966
Working capital	$ 6,008,890	$ 5,960,296	$ 6,107,468	$ 6,451,388	$ 6,309,705	$ 6,533,192	$ 7,185,147
Surplus	$ 650,691	$ 2,251,203	$ 3,209,484	$ 3,312,245	$ 4,035,940	$ 4,681,694	$ 5,093,287
Net worth	$12,934,461	$14,562,187	$15,247,595	$15,206,703	$15,946,337	$16,408,415	$17,124,438
Funded debt	$ 4,210,000	$ 2,922,500	$ 1,073,000	$ 928,000	None	None	None
Unit shipments	103,841	104,049	115,541	116,607	182,503	229,668	240,340

These Pictures Show the Equipment Which Made Up Household Refrigerator Line in 1922 and 1923

Universal Cooler Corporation
Detroit, Mich.
Sept. 2, 1936

Gentlemen:

Here is a piece of "literature" of what is today a competitor. As a matter of fact this was just about all of the literature available but this accordian fold tells a number of stories:

The Lorillard cabinet (See Fig. 1) housed many Deluxe installations in 1922 and 1923. Units were sold F. O. B. dealer's place of business and the necessary wiring back to the main lighting switch was an extra charge which kept the salesman and office forces in hot water since the salesman tried to keep from letting his customers know just how much that wiring would run for fear he might scare the customer out entirely. The deep opening in the brine tank was a disaster because all the customers wanted it and the charge was $50.00 net, extra. The small freezing tray was of the muffin type but it was soon superceded by the same general type which is in use today.

The idler (See Fig. 2 and 3) was perhaps the greatest source of trouble although electric motors did not have the capacity for oil in those days. While most people would claim that oiling once a month was sufficient many a service call (and sometimes a burnt out motor) has resulted from an installation where the motor ran practically all of the time in much less than a month. It sometimes seemed as if once a week wasn't too often to oil the motor—it was the protective time to oil it.

Ice boxes fell into two catagories: Side icers and Top icers. The former took vertical tanks or coils (See Fig. 4) and the latter horizontal ones (See Fig. 5 and 6). Sometimes the ice compartment was even too small for the correct size of tank or coil which meant the salesman hadn't figured carefully enough. (It was, he thought, enough trouble to make the sale since the difference between an 06 and a 610, the former taking up to six cubic feet and the latter from six to ten cubic feet, was $50.00 to the customer; but to be restricted because the tank wouldn't fit was more of a problem.)

The intricate looking mechanism (See Fig. 7) was in reality a very simple thermostat. The illustration shows a step toward locating the unit beneath the refrigerator although this meant some entirely new construction and the sales plan was to "Put a unit into any good standard ice box." The Chrysler-Koppen refrigerator (See Fig. 8) "made in Detroit" served as a standard demonstation model on display room floors. Yes, the unit was located right alongside the refrigerator on the display room floor. And there was only one demonstrator on that floor, too.

The last installation was on what was a truly modern Seeger refrigerator in 1922 (See Fig. 9). This famous wooden cabinet served many an apartment house in those early days just as it is pictured.

This set of pictures was used in Chicago at 1108 Lytton Building where the Kelvinator distributorship was conducted in 1922 and 1923 by Charles Fenn, President and R. E. Densmore, Treasurer and General Manager. Richard Wallace was installation and service man and I was first salesman and then Sales Manager. Mr. Fenn had been selling Iskos in New York but as that company had problems he undertook the sales of Kelvinators in Chicago with Mr. Densmore.

A. S. "Pop" Terry was wholesale man and his son Lee Terry who had been in New York in Kelvinator Service Work was a salesman. "Pop" Terry is still selling Kelvinators at Commonwealth Edison in Chicago and his son just left the Kelvinator sales organization.

GEORGE MOISTER,
Director of Advertising

Howe Ice Machine Made First Installation in 1921

Howe Ice Machine Co. of Chicago, manfacturer of ice and refrigeration machinery, first installed systems of internal force feed lubrication for enclosed-type ammonia compressors in 1921.

This feature was developed by H. B. Howe, president of the company, with the assistance of his brother, C. W. Howe.

The use of positive lubrication led to the construction of large enclosed-type machines extensively used in the refrigeration industry today.

H. B. Howe, a native of Chicago, attended the Lane Technical High School before entering the field of refrigeration machinery, and is a member of the Refrigerating Machinery Association.

Goss Relates Story Of Kelvinator's Early History

By W. H. Long

One afternoon during the early part of 1913, two men carrying rolls of blueprints entered the Detroit office of A. H. Goss, at that time director of the Chevrolet Motor Co. (He is now regarded by the electric refrigeration industry as one of its earliest pioneers, as he was founder of the original Kelvinator Co. and first president of the Electric Refrigeration Corp.)

E. J. Copeland, one of the two visitors, an engineer prominent in Detroit manufacturing circles, introduced his thin, nervous companion as Nathaniel B. Wales, an inventor originally from Boston and then residing in Detroit.

Wales' blueprints outlined the design for an absorption machine for domestic electric refrigeration—then an almost unheard of piece of apparatus—on which he had been working for several years after his graduation from the Massachusetts Institute of Technology, where he had first become interested in the idea of refrigeration through mechanical means.

Recalling that day more than 23 years ago, Mr. Goss says that his first impression of Wales was that of a man "more full of ideas than a pin-cushion full of pins."

Wales Needed Capital

The proposition as outlined to Mr. Goss was that Wales had in the process of development a refrigeration machine which he was confident would work, but capital was needed to supply machine materials and shop facilities for further work on the apparatus.

At that time, Mr. Goss was associated with W. C. Durant in various branches of the General Motors Corp., acting primarily, he says, as a "negotiator" for the infant automobile firms under Durant's control.

After a lengthy conference on the subject of the new machine, Mr. Goss authorized Wales to proceed with the building of the model compressor, providing that expenditures did not exceed a specified sum. Mr. Goss advanced the money to Wales, and in a few months the first machine was ready for operation.

First Machine Rejected

From his small shop on Franklin Street, Detroit, Wales one day called Mr. Goss over to see the completed machine. Mr. Goss says he took one look at the inventor's huge mass of tubes, wires, and heavy parts, and told Wales not to even bother starting the thing up.

Wales, crestfallen, wanted to know why.

Mr. Goss replied that what he was interested in promoting was a refrigeration machine for *home* use, not for a factory or castle where space requirements were negligible. Besides, the unit used anhydrous ammonia—a highly explosive gas requiring heavy pressure to effect condensation—and it was therefore both impractical and dangerous.

Then Wales remembered a smaller compressor he had designed which discharged cool compressed air into the ice compartment of a refrigerator cabinet. Development of this compressor, with reduction to a still smaller size and using sulphur dioxide as the refrigerant, was financed by Mr. Goss.

Problem of Thermostatic Control

He relates that the main problem encountered by Wales, Copeland, and himself was the development of a thermostatic control to make the machine automatic in operation. In 1914, a diaphragm-type thermostat was perfected after the expenditure of $150,000. This control actuated a switch by expansion and contraction, according to the relative temperature of the air inside the cabinet.

Mr. Goss says that Copeland took charge of production in 1914, and by 1917 the problem of gas leaks and control were mastered.

Absorb Nizer Co.

In 1914, manufacturing operations were begun under the brand name "Kelvinator," a name invented by the New York advertising agency of J. Walter Thompson and Co., to whom Mr. Goss had suggested the name of Lord Kelvin, author of the laws of heat transference, in discussing possible names for the new company. Mr. Goss was named president of the firm.

Kelvinator, meanwhile, had absorbed the Nizer Co., makers of ice cream cabinets, a business in which the parent firm was becoming interested. This company also made a few machines for their boxes, and was associated with the Arctic Co., another ice cream cabinet firm, which was also absorbed by Kelvinator.

By Sept. 24, 1917, the company was incorporated as the Kelvinator Corp. of Delaware.

First Kelvinator electric refrigerators were placed on the market in Detroit during the spring of 1918; and 67 units were sold the first year, Mr. Goss says. By 1920, more than 600 machines were installed in Detroit, using the "remote" compressor installation—the compressor in the basement or elsewhere, with the cabinet in the kitchen.

During the early period of Kelvinator's development, 1913-1920, Mr. Goss states that he supplied most of the capital for the company's financial operations.

Divisions Joined Together

Physical expansion of the company continued rapidly during the first decade of its existance, and on Jan. 1, 1926 the Kelvinator, Nizer, and Leonard divisions were pooled in the formation of the Electric Refrigeration Corp., with Mr. Goss as president.

One year later, on Jan. 1, 1927, Mr. Goss retired as president of the Kelvinator Corp., and was succeeded by C. K. Woodbridge. Mr. Goss became chairman of the board of directors at that time. On August 1, 1928, Mr. Goss resigned this position, but continued as a director of Kelvinator.

He severed his long connection with Kelvinator on Dec. 5, 1932, when he resigned his directorship.

In expressing his opinion of the future of the electric refrigeration industry, Mr. Goss states that the present wired home market penetration of about 33% should be much greater.

Although he still maintains business offices in the Fisher Building, Detroit, Mr. Goss's time is mainly spent on his farm near Ann Arbor, Mich., where he raises prize cattle as a hobby.

Characterizing himself as a "plain dirt farmer," he has seen the industry grow beyond all expectations of its founders in the days 23 years ago when Nathaniel B. Wales was laboring on the first Kelvinator in a second story shop on Franklin street.

Steenstrup's Work Led to Invention Of 'Monitor Top'

Credit for General Electric's well-known "On The Top" unit, upon which much mechanical and merchandising emphasis has been laid, belongs to Christian Steenstrup, head of refrigeration design for G-E, who came to this country as a Danish immigrant boy in the middle of the 1893 depression.

Mr. Steenstrup's early interest in engineering led him to leave a Danish private school at the age of 14 to work in a machine shop. He continued his study of mechanics at a night school, working during the day to pay his tuition.

Coming to the United States in 1893, he obtained a position in a Bridgeport, Conn., machine shop and worked there until 1901 when he went to Schenectady, N. Y., and secured his first job with G-E in the tool department.

Early Genius for Improvements

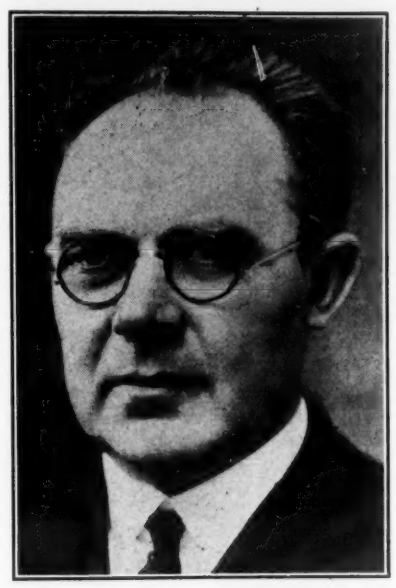
Two improvements in the operation of punch presses which he developed won him a position as assistant foreman, and shortly thereafter he was placed in charge of special mechanical work.

Subsequent advancements with G-E saw him become superintendent of ammunition manufacturing during the World War, assistant mechanical superintendent of the Schenectady works, and finally supervisor of mechanical research.

When G-E started development of a small refrigeration machine at Schenectady, Mr. Steenstrup was placed in charge of designing the unit. Since then, he has devoted his time to the construction of refrigerator models and assisting the Fort Wayne and Schenectady plants to place them in production.

The present "On The Top" unit used on the G-E line is the result of Mr. Steenstrup's work, and has led to his appointment as head of the company's refrigeration design department. This distinguishing feature has been the nucleus in advertising the G-E single-cylinder spring mounted unit, popularly known as the G-E "Monitor Top."

G-E Inventor



CHRIS STEENSTRUP

This Danish engineer worked in developing General Electric's first small refrigerating machine which formed the foundation for G-E's "Monitor Top" models. Today, he is head of G-E's refrigeration design department.

Ansul Began Making SO_2 during 1915

A pioneer in large-scale production of liquefied sulphur dioxide refrigerant, the Ansul Chemical Co., Marinette, Wis., began manufacturing operations about 21 years ago under the direction of its present president, F. G. Hood.

At that time the company made commercial sulphur dioxide for use in the textile and bleaching industries, and for the preservation of fruit. The presence of moisture in the commercial product was then not considered an impurity, provided it did not cause deterioration of shipping equipment or of the customer's apparatus.

With the advent of electric refrigeration and the increasing use of sulphur dioxide as a refrigerant, Ansul chemists began perfection of the chemical to remove excess moisture from it and thus avoid contamination of the product in transit and injury to compressor cylinders.

Shortly after the World War, H. V. Higley, formerly chief chemist for the Isko Co., became associated with Mr. Hood in the Ansul firm. During this time, major attention of the company was held toward advancement of sulphur dioxide as a refrigerant.

Several of the pioneer refrigeration companies adopted Ansul sulphur dioxide as a refrigerant, and the company extended its production facilities to meet increasing demands for their product.

In 1934 Ansul introduced methyl chloride as a companion chemical in their line, and the "Ansul Twins" advertising idea was developed.

The Ansul company maintains over 60 distribution centers at various points throughout the country, and carries on an extensive foreign distribution.

BUILT-IN *Dependability*

M. & E. performance spells permanent profit for the dealer. For these compressor units are not only built to sell—*but to stay sold;* not only to assure you a generous profit on each sale—*but to guarantee that this profit is a genuine one which will not be eaten up by future costly service attention.*

Sound engineering development including many exclusive features—precision workmanship of a high order—and the finest materials available—have been combined to provide those in-built qualities which can be fully appreciated only through years of experience with the faultless reliability—smooth, permanently quiet operation—freedom from repairs—and power saving efficiency of these modern refrigeration units.

Share in the widespread user satisfaction that is building business and good will for M. & E. dealers everywhere. There is an M. & E. unit for every refrigeration need—forty-five compressor models; from ¼ h.p. to 15 h.p.; water and air cooled; electric motor or gas engine driven. Complete details on request.

● Illustrated: M. & E. Compressor Unit No. A-24000 W. F., 4 cylinder, 15 h.p., water cooled.

FORCED LUBRICATION with special provisions to prevent gases from coming in contact with the crankcase oil, thus avoiding excessive oil circulation.

AUTOMATIC BELT TIGHTENER—this prevents belt trouble and loss of power.

COUNTER-BALANCED CRANKSHAFT—made of drop forged Molybdenum Steel, thus eliminating vibration.

CONTINUOUS FIN TYPE—Water Cooled Condensers with counter-flow principle.

MERCHANT & EVANS COMPANY
PHILADELPHIA, PA., U.S.A.
Plant at LANCASTER, PA.

MERCHANT & EVANS COMMERCIAL COMPRESSORS

Frigidaire's Growth Traced Back To 1920 When It Became a General Motors Property

The Frigidaire line of household and commercial refrigerating equipment had its beginning in 1916 with the incorporation of Guardian Frigerator Co. in Detroit.

Factory space was rented on the fourth floor of a Farrant Street building. Here there were two lathes, a shaper, a hand milling machine, drill press, tool grinder and some small tools. Three quart bottles were used to distill the sulphur dioxide used as refrigerant. Fifty machines were built and sold during the first year.

Following America's entrance into the chaos of World War, the new business found it difficult to raise additional capital. As a result it was sold in 1918 to William C. Durant who took it over as a personal investment.

Frigidaire Name Adopted in 1919

On February 8, 1919 the name of the company was changed to The Frigidaire Corp., taking the new name which had been given the product.

Shortly thereafter Mr. Durant sold the company to General Motors, which engaged in the manufacture of the equipment in Detroit until 1920 when the business was turned over to the Delco-Light Co., Dayton subsidiary of General Motors.

The real growth of the present Frigidaire business dates from the time it was turned over to Delco-Light. This organization was engaged in manufacture of individual electric light plants for farm homes.

Specialty Selling Experts

It had an excellent rural field organization, skilled in specialty selling. At that time R. H. Grant, now vice president of General Motors in charge of sales, was president of Delco-Light. He immediately set about reengineering and redesigning the product.

In this undertaking he had the help of Charles F. Kettering, now General Motors' vice president in charge of research. Mr. Kettering had developed Delco equipment (lighting, starting and ignition systems for automobiles) and Delco-Light, both of which previously had been acquired by General Motors.

Kettering Interested in Refrigeration

He first became interested in electric refrigeration as an appliance to be hooked up with the Delco-Light plant as an added convenience for farm homes. Since that time he has taken a leading part in Frigidaire's engineering councils.

When Mr. Grant left the Delco-Light Co. in 1925 to become Chevrolet's sales manager, the product had been greatly improved in design and performance. And the Delco-Light organization was developing a fast expanding market for equipment.

E. G. Biechler, sales manager of Delco-Light under Mr. Grant, succeeded him as president and is president and general manager now.

With his associates, he speedily put the business on a mass production basis by expanding the sales organization, developing overseas markets, and putting through a factory expansion project which was climaxed by sweeping price reduction.

The product was highly improved, the market was becoming more receptive and a great sales organization was being formed and trained to merchandise Frigidaire in every country in the world.

Then came sharp price reductions, widening the market, increasing the number of prospects literally by hundreds of thousands. Sales mounted with dizzy speed.

Separated from Delco in 1926

The Dayton factories operated on triple shifts, while thousands of workmen were engaged in the construction of larger buildings and the installation of special mass production machinery.

By this time (1926) Frigidaire sales were many times those of Delco-Light. The tail was wagging the dog. Accordingly the two businesses were completely separated. The present Frigidaire Corp. was formed with Mr. Biechler as its first president.

Coincident with the development of the American market was a great expansion in the export field. Within a short time there were more than 2,000 people in the Frigidaire overseas field organization and the export business rose rapidly.

Export of Commercial Units

In the export field most of the business done had been in the commercial field, but the idea of household refrigeration slowly was attaining the measure of popularity it enjoys in this country.

The retailer of foods needed refrigeration for the protection of his stocks while the householder, to a much greater extent then in the United States, followed the practice of buying provisions for but one meal at a time.

Since 1926 the progress of the company has been marked by a steady improvement in the quality of its products, and by price reduction.

Add Ice Cream Cabinets in 1924

Frigidaire started with the idea of confining its activities to the household refrigeration field. But in 1924, at the request of a number of ice cream manufacturers, it began to build electrically refrigerated ice cream cabinets.

Because of the comparatively high refrigeration load they were compelled to carry, ice cream cabinets required heavy duty compressors. The development of these compressors marked the real beginning of the company's refrigeration business.

Because the commercial unit could be sold by the increased profits argument, the commercial division of the business grew with great rapidity—at one time exceeding 50% of the company's total sales volume.

Apartment House Market

The household division of the business first showed the tremendous market that existed when the company began to cultivate the apartment house field. Thousands of units were purchased for installation in apartments within a comparatively short time—a good indication of the tremendous popularity of electric refrigeration that was to become manifest later.

Electric water coolers were added to the lines of Frigidaire products in 1926.

This engineering progress made Frigidaire's entry into the air-conditioning field in 1932 logical and easy. Air conditioning called for a heavy refrigerating load, for which Frigidaire's commercial equipment was adapted.

Air Conditioning Advancement

The company's first years of real activity in air conditioning saw the installation of Frigidaire equipment in many industrial plants as well as in hundreds of homes, offices, and retail establishments. This year several more advancements have been made.

Although the company began selling air-conditioning units as such in 1932, the actual beginning of the practice of air conditioning within the Frigidaire organization would be rather difficult to fix accurately due to several years of experiments with equipment carried on before the product was offered to the market.

Installations of refrigerating mechanisms for actual air-conditioning work were made by the field selling organization long before the factory decided officially to sponsor such applications.

Office Fans Used at First

In the early days, ordinary commercial compressors and finned cooling coils were utilized by the field for certain experimental sales. Ordinary office type electric fans furnished such air motion as was needed, or at least such as was secured.

The number of such field-assembled installations was not great—possibly not exceeding 10 or 12—during the years from 1924 to 1928. While the uses were varied, it is probable that the majority were used for sick rooms and in certain types of commercial offices.

The first installation was made in 1926 for air conditioning textiles. In this, finned coils and standard office fans were used to provide an atmosphere with consistent moisture content.

In 1927 and 1928, a few miscellaneous sales were made, largely for sick rooms, and using regular Frigidaire refrigerator equipment and local ingenuity.

First Factory Built Units

In 1929 the first factory-built and factory-sponsored equipment was produced. This consisted of one unit, called a room cooler, and was made up of a special low side coil and a fan mounted in a metal cabinet.

The compressor for operating the unit had to be located apart from the cooler, usually in the basement. This first cooler was built to furnish about one ton of refrigeration.

Because of the nature of the equipment and the amount of so-called engineering which seemed to be necessary in those early days, it naturally fell to the lot of the commercial department for handling. This was true even though a number of sales were made in residences.

Restaurant Installation

It was in 1929 that the first installation was made with the purpose of increasing business in commercial establishments. This was in Rheaume's Restaurant in Detroit, where eight room coolers and eight compressors were installed in a basement dining room.

In 1930 Frigidaire produced the first revised edition, so to speak, of the original grey cooler. This had better appearance, quieter operation and improved air control.

It was in the fall of 1931 that the first air-conditioning school ever held within the organization was conducted at Dayton. It was not national in scope, but was attended by one or two representatives from each of eight or nine selected districts in position to give attention to air conditioning at that time.

Selling Methods Changed

The first piece of literature was produced that could be used somewhat in the manner of a selling album.

While up to this time all air-conditioning work came under the sponsorship of the commercial department, it was in this year that the first man was assigned exclusively to the pursuit of air-conditioning sales investigation work.

In 1932 the first basic changes in the Frigidaire organization structure came about. From the experience gained in the previous years of effort, the factory management came to the conclusion that better progress could be made by the creation of a special air-conditioning sales division.

'Room Cooler' Disappears

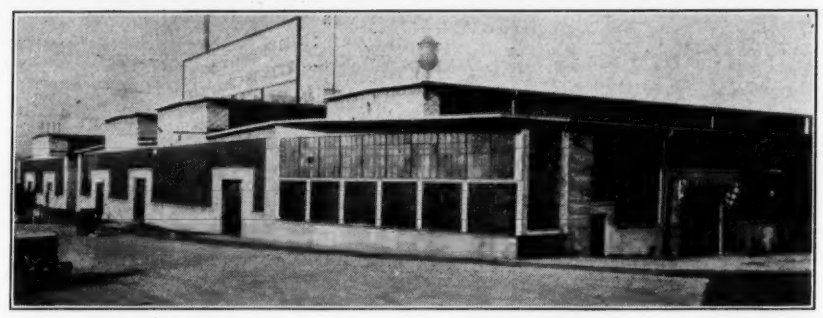
About this time the name "room cooler" began to disappear and substitution of the name "air conditioning" was effected.

The first real expansion in the line of products was effected in 1932 when the Frigidaire engineering department produced floor models and the model for overhead suspension work. Simultaneously with the introduction of these units, there were made available 2 and 3-hp. compressors.

President Since 1925

E. G. Biechler, president of Frigidaire Corp., has held that position since the company was formed in 1926. Before that he was president of Delco-Light which manufactured Frigidaires.

Frigidaire's First Dayton Home



Frigidaire really got its start in this unattractive building. Frigidaire had not much more than a cubbyhole when it was sent to Dayton by General Motors. A score or more of employes made up its force.

LINE YOU UP FOR A

BIG SHARE OF REPLACEMENT BUSINESS

Cutler-Hammer Control, time-tested and proven on hundreds of thousands of popular refrigerators, is now available as a replacement unit. With only 4 models you are ready for 99% of the business in your community (one for sulphur dioxide systems, one for methyl chloride, two for temperature in 24" and 48" tube lengths). Small stock means small capital outlay, fast turnover, no shelf-losses.

Each control provides wide-range cold control, the famous C-H overload, protection to motor under all circumstances, simple and rugged design, modern and attractive appearance.

This control installs easily behind the evaporator shield . . . either horizontally or vertically. A screw in the knob adjusts cold control. A screw in the rear lengthens differential. One screw removes cover for inspection.

Replacement Control for Beverage Coolers and Ice Cream Cabinets rounds out this line. The market is waiting; this concentrated line should bring big returns. Send NOW for descriptive literature; see your jobber for supplies. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1362 St. Paul Avenue, Milwaukee, Wis.

CUTLER-HAMMER

REFRIGERATION CONTROL FOR REPLACEMENT SERVICE

Fairbanks-Morse Refrigeration History Is The Story of Three Pioneers

Jones Progressed Through All Selling Steps

W. Paul Jones, vice president and general manager of the Home Appliance Division of Fairbanks-Morse & Co., Chicago, began his career in the refrigeration industry in 1920 as a stenographer and service man for the Frigidaire Corp.

During his connection with Frigidaire, which lasted until 1929, Jones was subsequently retail salesman, sales supervisor, sales manager for distributors, and Evansville, Ind., distributor. So successful was he in selling Frigidaires in Servel's home town that Servel, Inc., hired him to work in their Evansville, Ind., plant in the capacity of educational director.

Jones was later appointed advertising manager of Servel. He remained with Servel until March, 1935, when he was appointed vice president of Fairbanks-Morse Home Appliance Division.

As a distributor, Jones not only pioneered in building the present-day refrigerator dealer organization, but he was the originator of what in those days was called the "fall selling plan."

This method offered the purchaser a refrigerator in later fall or early winter and required no further payments until the following spring, four months after the purchase. This helped to ease the dealers over the seasonal slump.

Jones also advocated the time-payment system of selling, and was among the first to urge dealers to operate on this plan.

Peltier Got Refrigeration Start with E. T. Williams

F. D. Peltier, chief engineer of refrigeration for the Fairbanks-Morse Co. Home Appliance Division, Chicago, Ill., secured his first position in the electrical field with the New York Edison Co. soon after he had been graduated from the Brooklyn Polytechnic Institute in 1914.

Peltier was detailed from the Edison company to make the first preliminary tests of a rotary refrigerating machine developed by E. T. Williams. When Williams started production of his small automatic refrigerating machine for household use in 1916, he employed Peltier.

While in the employ of Williams, Peltier introduced to the refrigeration industry a number of refinements and innovations. He is recognized as the designer of a machine employing a high side float and flooded evaporator, a machine using natural draft air-cooled condensers, and a four-blade rotary compressor with the blades set at an angle to reduce friction.

Williams and Peltier displayed an exhibit at the Grand Central Palace in New York City about 1917, and Thomas A. Edison, who was very much interested in the possible development of this industry, visited the demonstration.

After leaving Williams, Peltier was connected with both the Electric Refrigerator Co. and the Holmes Refrigerator Co. doing research and engineering work.

About 1928, Peltier joined the Servel Corp., with which he remained for over seven years. During his association with Servel he was a research engineer, assistant chief engineer, and assistant to the vice president in charge of production.

In November, 1935, Peltier was appointed chief refrigeration engineer of the Fairbanks-Morse Home Appliance Division.

Schmidt Has Background From Two Companies

Karl F. Schmidt, assistant chief engineer of the Fairbanks-Morse Refrigeration Division since 1934, is a graduate mechanical engineer of the University of Munich, Germany, and a post-graduate in chemical engineering of the University of Edinburgh, Scotland.

Prior to his connection with the Fairbanks-Morse Co. Schmidt had been in the employ of the Grigsby-Grunow Co. of Chicago, manufacturers of household electric refrigerators and radios, as field and production engineer.

He was also in the employ of the Norge Corp., Detroit, as field and production engineer, and had been assistant general works manager of the Buenos Aires & Great Southern Railroad in South America.

With W. Paul Jones and F. D. Peltier, Schmidt was largely responsible for the development of the Fairbanks-Morse Conservador refrigerator which was introduced late in 1934.

Gibson, Long in Ice-Box Industry, Made Contributions in Field of Cabinet Design and Construction

Gibson Electric Refrigerator Corp., of Greenville, Mich., producers of household and commercial electric refrigerating systems and cabinets, ice cream cabinets, and draft and bottle beer coolers, lays claim to having introduced into the refrigeration industry a number of innovations in cabinet design and construction.

Among them are the automatic interior light, the automatic dome light, and the flat wire or ribbon type refrigerator shelves.

According to R. E. Wilson of the company's advertising department, the Gibson Refrigerator Co. was one of the first organizations to use the foot-pedal door opener and to adapt streamline design to the refrigerator cabinet.

Wilson states also that Gibson was first to develop a hermetic unit which could be serviced in the field by independent service men, and that the Magic Freez'r Shelf, designed to permit the air in the refrigerator to retain a higher degree of humidity, was invented by Gibson engineers.

Men who have aided in the development of the Gibson Electric Refrigerator Corp. are Charles J. Gibson, president of the company, the late Frank S. Gibson, Sr., father of Charles J.; John Lewis, one of the founders of the company; H. E. Rosebrook, chief engineer; and Joseph N. Roth, in charge of engineering development.

Upon completing his college work, in which he specialized in business administration, Charles J. Gibson joined his father in the manufacture of ice refrigerators and received training in both the production and selling of refrigerators. After the death of the elder Gibson in 1926, Charles was elected president of the company, then the Gibson Refrigerator Co.

In 1929 the development of an electric refrigerator was begun by the company, and the Gibson electric refrigerator was first introduced at the Furniture Market in Chicago in January, 1931.

John Lewis' connection with the refrigeration industry dates from 1876. He was among the first to adapt the principle of air circulation to the domestic refrigerator.

Lewis relates that in the early days of his connection with the business a large number of refrigerators were insulated with powdered charcoal, and it was difficult to prevent it from sifting through the linings and exterior of the cabinets. He also recounts his first experience with white interiors of cabinets.

At that time refrigerators were lined with zinc which became corroded after long use. Lewis learned of a second-hand dealer in New York who had increased his sales by painting the interiors of ice boxes white. A representative was sent to investigate, and, according to Lewis, the Gibson Refrigerator Co. adopted the idea.

Not being satisfied with a painted interior, Lewis says, the Gibson Co. originated the baked white enamel finish and later developed the one-piece porcelain enamel interior.

H. E. Rosebrook, chief engineer of the Gibson Electric Refrigerator Corp., joined the research engineering department of the Westinghouse Corp. after he had obtained a Bachelor of Science Degree in electric engineering at Ohio Northern University.

A year later he was made assistant resident engineer in the Mansfield works. In 1932 Rosebrook joined the Gibson organization and was given complete charge of the testing and research laboratory. After spending two years in this department, he became chief engineer in charge of cabinet design.

Under his supervision the Gibson Co. modernized its cabinet design and construction. In 1936 Rosebrook was promoted to chief engineer with complete charge of the development of mechanical features. It was largely through his study of evaporators that the Freez'r Shelf was developed.

The first experience of Joseph N. Roth in the engineering phase of refrigeration was with the Bishop & Babcock Co. of Cleveland, O. He later spent five years with the F. A. Burroughs Consulting Engineers of Chicago on ice plant design.

In 1927 Roth joined the Montgomery Ward & Co. research department of household refrigeration development. He became affiliated with the Gibson Co. in 1934. Through his efforts the Gibson Kero Unit was developed.

Stewart-Warner Began Marketing Its First Line Of Household Electric Refrigerators in 1932; Company History Dates Back to 'Nineties'

In 1926 the Stewart-Warner Corp. of Chicago, recognizing the possibilities in household refrigeration, began experimenting in the company's laboratories, and in March, 1932, production of three household refrigerator models was announced.

The Stewart-Warner refrigerators, considered by the company a good companion line to radio since each offset the seasonal slump of the other, were of three sizes: the small, the "Town House," and the "White House."

The refrigerating unit was installed in the bottom of the cabinet, and sulphur dioxide was used as the refrigerant.

Charles W. Strawn, who had been manager of the radio wholesale division of Stewart-Warner, was appointed sales manager of the refrigeration. He has been succeeded by J. F. Ditzell.

Changes in Refrigerator Design

Since that time the Stewart-Warner Safety Zone refrigerator has undergone several changes in cabinet design and unit assembly. The greatest improvement in the cabinet itsef is the new completely seamless vaulted construction, eliminating all rubber gaskets.

In the latest de luxe models the freezing control dial is made of glass, being illuminatedby the same bulb that lights the interior of the cabinet. Another recent feature is the Tilt-A-Shelf, a folding shelf on each side of the evaporator.

The Sav-A-Step compartment is mounted on separate hinges and swings out from the cabinet.

Clipper Was First Product

History of Stewart-Warner dates back to the early nineties when J. K. Stewart, founder of the company, invented and began the manufacture of a mechanical device for clipping or shearing horses and sheep.

The clipper was driven by a flexible shaft that was the forerunner of the present Stewart-Warner speedometer shafts.

In 1900 Stewart formed a partnership with Thomas J. Clark, and the firm was named the Sterk Mfg. Co.

In a little one-room factory on Wells Street, Chicago, they began the manufacture of accessories for the infant automotive industry. Their first product was an automobile horn called "The Long Distance Siren."

Speedometer Made in 1905

First Stewart-Warner speedometer was developed in 1905. A year later the Sterk Co. was reorganized as the Stewart and Clark Mfg. Co. The factory was moved to a two-story building located on the site of the present plant of the Stewart-Warner Corp. Growth of the business necessitated the enlargement of the factory in 1908.

The Stewart and Clark Co. was merged in 1912 into the Stewart-Warner Speedometer Corp., the new organization absorbing also the Warner Instrument Co. of Beloit, Wis., manufacturer of speedometers. First Stewart-Warner vacuum tank for automobiles was introduced in 1913.

Stock of the Stewart Mfg. Co., one of the world's largest die-casting plants, was acquired by Stewart-Warner in 1920. The Sicklen Speedometer Co. was purchased by Stewart-Warner in 1921, and three years later the factories and assets of the Jones Speedometer Co.

In November, 1924, Stewart-Warner absorbed The Bassick Mfg. Co., makers of Alemite pin-type and push-type high pressure lubricating systems, and The Bassick Co., large manufacturer of casters and one of the largest producers of furniture and motor car hardware.

Radios Brought Out in 1925

Stewart-Warner began the manufacture of radios in 1925 and was a pioneer in short-wave radios for the home, introducing a short-wave converter in 1930.

Early in 1933 a change in management of the corporation placed Joseph E. Otis, Jr. and Frank A. Hiter at the head of the organization, Otis becoming president and Hiter vice president and general sales manager.

Assisting Hiter is Charles D'Olive, who is very active in the direction of refrigeration department affairs.

The Chicago factories of the corporation now employ more than 5,500 men and women and occupy 1,200,000 square feet of floor space—a considerable increase over the original half acre of the Wells Street building.

Leonard, 55 Years in Cabinet Making, Is One of Biggest

Founded by C. H. Leonard in the back room of a Grand Rapids crockery and hardware store in 1881, the Leonard Refrigerator Co. of Detroit, now a subsidiary of Kelvinator, celebrated its fifty-fifth anniversary this May.

Practically a two-man enterprise in its early days, the company now claims to be the largest single employer of Grand Rapids labor, with the largest plant in the world devoted exclusively to the manufacture of refrigerator cabinets.

Among refrigerator improvements which company officials say Leonard was the first to introduce are the first cleanable refrigerator, the first one-piece porcelain interior, the first side-iced ice box, and the first all-porcelain refrigerator cabinet. In 1921, Leonard pioneered what is said to be the first cabinet exclusively for mechanical refrigeration.

The "Leonard Cleanable" was advertised to the public in the *Ladies Home Journal, Saturday Evening Post,* and *Good Housekeeping* as early as 1890. This is claimed to be the first national advertising campaign launched in the refrigerator industry.

Leonard's first all-steel cabinet was marketed in 1927 after the company decided on the advisability of eliminating wood in refrigerator construction.

In 1930, the company entered the electric refrigeration field exclusively, 49 years after C. H. Leonard and his lone helper made their first ice box in Grand Rapids, a "top icer" in a wood cabinet.

Since then, Leonard has introduced the "Len-a-dor," a convenient foot-pedal opening device; the "Chill-o-meter," a freezing-speed control covering 12 ranges and giving normal setting, starting, stopping, and defrosting on a single control panel.

Rubber grids, interior lighting, sliding shelves, moist storage crisper, vegetable drawer, and rearranging shelf feature its line.

This year's model, company officials say, operates on 40% less electric current than any previous Leonard. Among the new features are porcelain and "Permalain" finishes, newly-designed hinges, a trigger-action door handle, more rigid shelves, and all-porcelain freezing units.

More than three million Leonards have been built, according to records of the company.

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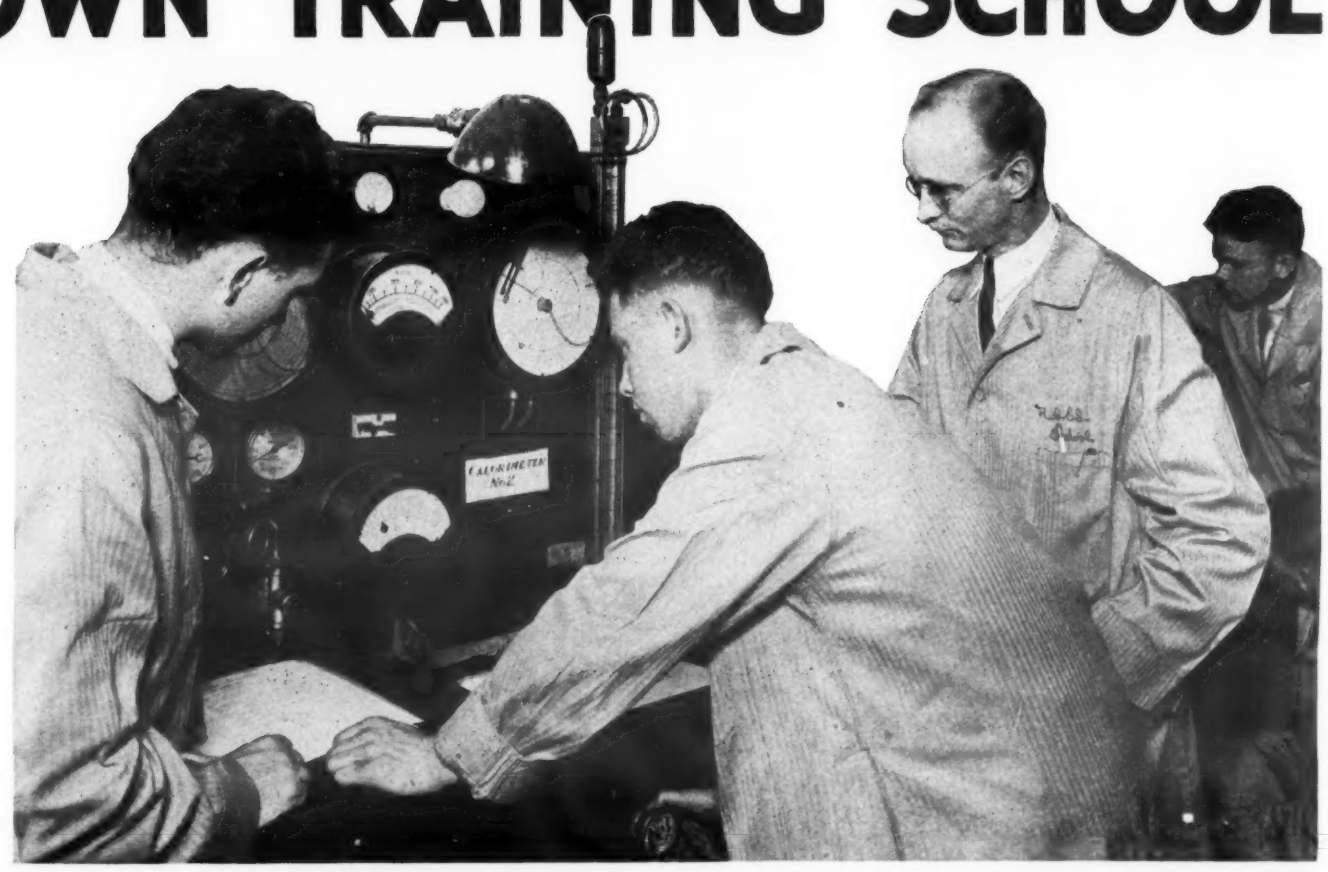
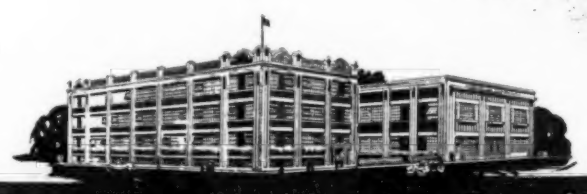
This invitation is extended to employers everywhere. Also, to ambitious men—with or without experience—who see in refrigeration and air conditioning, an opportunity to realize their ambitions. Write today for complete information and details. No obligation of course.

Ray D. Smith
President





VIEW IN R-A-C-I $35,000.00 CHICAGO SHOPS AND LABORATORIES

The most completely equipped refrigeration and air conditioning Shops and Laboratories ever devoted to educational purposes. Here are located two complete, operating, year 'round conditioning systems; all the leading makes of commercial refrigeration equipment and all types of coolers, boxes and display cases; every type of household refrigeration apparatus including the most recent models of the representative manufacturers. Tuition includes transportation to and from Shops, use of all necessary tools, testing apparatus and shop equipment including calorimeter, de-hydrating oven, evacuating equipment, oil and refrigerant charging apparatus, streamline and silver soldering equipment, volumetric testing apparatus, valves, gauges, etc. In fact, every type of modern equipment is here for students to work on and with.

Refrigeration and Air Conditioning Institute ★ 2160 Lawrence Avenue ★ Chicago

Development of Hermetic Unit By Westinghouse Started With Experiments in 1921

Westinghouse Electric & Mfg. Co., whose refrigeration manufacturing operations are concentrated at East Springfield, Mass., began experiments on the engineering of small refrigerating machines as early as 1913.

Engineering investigations were continued until 1919 when actual experimental and development work was instituted by company executives.

From 1919 to 1921 a number of types of small absorption machines were built and experimented with at the company's South Philadelphia works, but none showed sufficient promise to warrant their development to the commercial stage. Because of an inherent low efficiency it was found uneconomical to operate them electrically.

As a result of early interest, the company in 1921 began experimental and development work on hermetically sealed units, the early designs employing single-stage, rotary-vane compressors, and utilizing ethyl chloride.

At that time the Westinghouse Co. decided that such a machine should have its motor and compressor directly connected and enclosed in a hermetically sealed casing.

Subsequent developments proved the original premise to be correct, and for 15 years since then Westinghouse Co. has been experimenting and developing this particular type of machine, without interruption even though many other types have been reviewed from time to time.

It is interesting to note that when Westinghouse started its development work, the machine was so designed as to be capable of employing a refrigerant and lubricant which were miscible. As the new Freon refrigerants are miscible with the lubricant, the machine was rapidly adaptable.

A number of early water-cooled hermetically sealed machines were built and placed in the field for service tests. As a result of this experience it was decided that water cooling was unsatisfactory for the company's household refrigerator specifications.

From 1921 to 1926 various types of machines were investigated, both open and hermetically sealed, high speed and low speed, rotary and reciprocating compressors. Many of these machines were designed and built in the Westinghouse laboratories; others were purchased elsewhere.

During this period the work was carried on in South Philadelphia, East Pittsburgh, and Mansfield under the general supervision of M. C. Terry, with a collaboration during part of that time of Andrew Kuchner and Doctor Frank Conrad.

On the basis of all the previous work, it was decided to build a hermetically sealed reciprocating compressor. That design has never been changed. The company is now building this type of machine in sizes up to 23 tons.

One of the interesting features of the first machines was the magnetic fan drive. The fan motor of this machine was driven electro-magnetically through the separating wall by the rotation of the compressor motor. This fan drive was later replaced by the present external rotor, lifetime-oiled fan motor.

The compressor was incorporated into a refrigerating machine mounted on top of the cabinet and embodying such features as a porcelain evaporator, unit construction, and the Westinghouse Built-in Watchman for thermal and other features.

The cabinet even on this first machine had the flat top that has characterized all Westinghouse machines since.

The Westinghouse refrigerator of today is basically the same as the first Westinghouse domestic refrigerator. Changes have been made to improve the reliability, serviceability, efficiency and appearance. Most of these changes have been made under the direction of J. H. Ashbaugh.

They include replacement of the porcelain froster with a Sanalloy froster, substitution of steel for cast iron for the external shell of the machine, increase in motor and compressor efficiency due to higher speeds and better valve design, and a hermetically sealed all-steel cabinet that combined improved appearance with durability and efficiency.

During the first production period the engineering and sales organizations were in Mansfield, Ohio. The compressors were built in East Springfield and the rest of the unit and final assembly made in Mansfield.

Late in 1930 the engineering department was moved to East Springfield, and early in 1931 all refrigerating unit manufacturing was concentrated in East Springfield where it is still carried on.

Some of the early cabinets were purchased from outside suppliers, but shortly after starting production a set up was completed to build cabinets in Mansfield. All of the Westinghouse domestic cabinets are now made there.

The design and construction of commercial units were started shortly after production was concentrated in East Springfield, the design following closely after the domestic design. The commercial line now includes condensing units, water coolers, beverage coolers, and low side and control equipment.

In 1933, manufacture of half-ton and one-ton air conditioning cabinets was begun in the Westinghouse Chicopee Falls plant, and manufacturing of compressors and railway cooling equipment and two to six-ton air conditioning units was begun in East Pittsburgh. In 1935 all air conditioning activity was concentrated in East Springfield.

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Servel First to Use Methyl Chloride in Commercial Units

Company Started Work In Household Field With Units in 1922

A pioneer in the development of the commercial refrigeration field, Servel, Inc., of Evansville, Ind., claims to be the first refrigeration manufacturer in this country to have successfully used methyl chloride refrigerant on a commercial basis.

Founded in 1922 to manufacture domestic and commercial refrigeration products, Servel built its entire program around methyl chloride. At that time, no plant in the country was equipped to manufacture this chemical in volume but Servel engineers helped convince the company which is now the R. and H. Chemicals Dept. of E. I. Du Pont de Nemours, Inc., that methyl chloride had a future in the refrigeration industry. The latter company agreed to invest in the equipment to manufacture it in quantity.

It was not in the commercial field, however, that Servel gained its first experience. Like many another manufacturer of refrigeration equipment in the pioneer days, Servel began by supplying domestic units to be installed in the customer's ice box. But it was not long before Servel realized the demands of the market for a complete unit, and the company claims to be one of the first to market nationally a self-contained domestic box.

Noting the success with which larger Servel domestic units were used for commercial purposes, the company in 1926 offered five standard models designed expressly for the commercial field, the largest of which was a 1-hp. water-cooled machine. Models were added from year to year, each differently designed, until by 1932 the company boasted a variety of individual models. In that year all commercial units were redesigned to conform to a standard pattern differing only in size and capacity.

The "Humidraft" line of evaporators, designed in a series to balance the compressor line, also was introduced in 1932. This group of forced-convection cooling units was adaptable to air conditioning, which field Servel entered in 1932.

The growing importance of air conditioning led Servel to expand its production in 1934 to include new models of air conditioners and larger compressor models, and to redesign its compressor line to use Freon-12 interchangeably with methyl chloride. At present time the Servel commercial line includes compressors of from ⅛ to 15-hp. capacity, together with corresponding air-conditioning high sides.

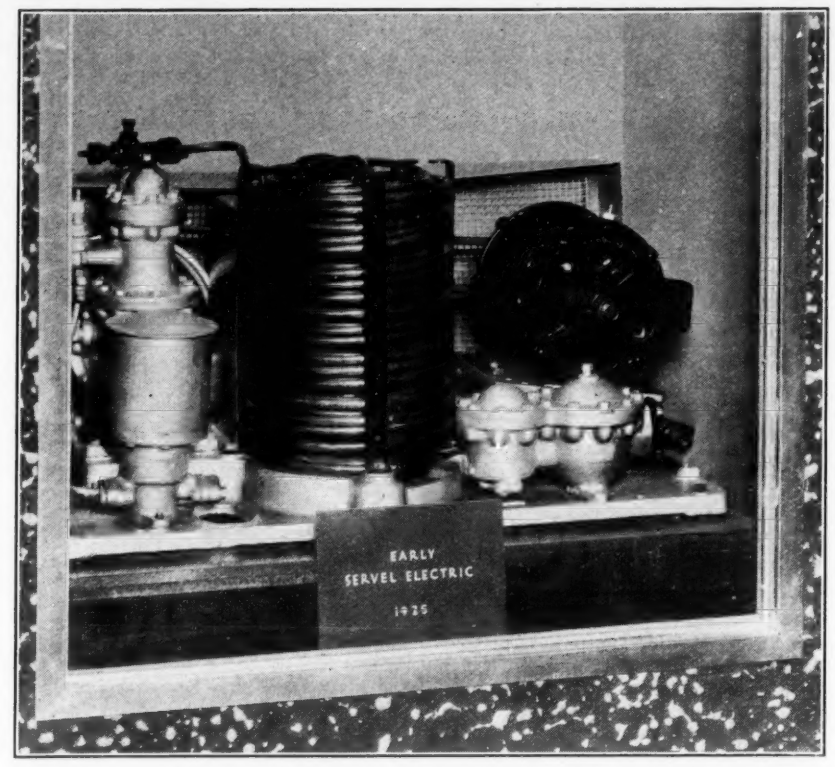
During the development of its commercial and air-conditioning lines Servel had not been neglecting the household field in which it gained its start.

An extensive line of conventional household units was presented to the trade each year from 1922 on.

In 1927, Servel brought out a continuous-absorption type machine, the Electrolux, built under Swedish patents, using gas as fuel source. Farm models also were marketed, using kerosene instead of gas. Although other companies entered the absorption refrigerator field, and several others are at the present time manufacturing units of this type, Servel Electrolux has dominated this branch of the industry continuously since 1927.

By 1934 manufacturing activities had reached a diversity beyond facilities. Accordingly Servel decided to eliminate a number of lines, most important of which was the conventional-type household refrigerator.

Since that time activities have been concentrated on standard commercial refrigerating machines, the Humidraft commercial high-side line, and air conditioners in the Commercial Refrigeration Division; and on Electrolux gas refrigerators in the Electrolux Refrigerator Division.



A 1925 Servel household unit, built for remote installation. The machine employed a water-cooled condenser and a Century motor. Century Electric Co., which supplied the photo, claims to have built the first fractional horsepower motor which would not affect lighting circuit voltage.

Sunbeam's Coldspot Unit Is Development Of Rotorite Condensing Machine

Sunbeam Electric Manufacturing Co. of Evansville, Ind., manufacturer of the Coldspot electric refrigerator marketed by Sears Roebuck & Co., is an outgrowth of the Schroeder Headlight and Generator Co., founded in 1883 by Adam Henry Schroeder, pioneer maker of oil-burning headlights for locomotives and industrial uses.

Control of the company passed into the hands of W. H. McCurdy and W. A. Carson, now president of Sunbeam, in 1917, when the Schroeder interests withdrew from active control of the firm. In 1920, the company changed its name to the Sunbeam Electric Mfg. Co.

The company entered the electric products manufacturing field in 1908 by powering their oil-burning headlights with electricity and started the production of farm-lighting plants in 1918. Three years later the Surf Mfg. Co., of Milwaukee, was purchased and production of "Sunbeam Surf" electric washing machines was begun under the firm name of the Sunbeam Domestic Appliance Co.

In 1923 the two Sunbeam companies were merged under the original name, and in 1926 abandoned the washing machine field to return to the manufacture of farm lighting plants, locomotive headlights, and turbo-generators.

Patents and manufacturing facilities under which the present Coldspot units are made were acquired by Sunbeam in 1929 when the company purchased the Rotorite Corp. Rotorite had been formed in 1926 by a group of business men led by J. H. Dennedy, Sunbeam's present chief engineer. The company in 1928 sold a one-year option on its product, a rotary compressor for electric refrigeration, to the Indian Motorcycle Co., of Springfield, Mass., and 300 "Zeroaire" units were sold that year in New England.

When the option expired in 1929, Charles Levine, trans-Atlantic flyer, and his associates purchased the Indian company and the option on the Rotorite unit was allowed to lapse.

Sunbeam's first contacts with Sears Roebuck had been made through W. H. McCurdy, chairman of the board of directors, who was also president of the Hercules Buggy and Gas Engine Co., a firm which supplied the mail order house and also made refrigeration units for Servel, Inc.

In 1928, the Indian Company had agreed to supply refrigeration units to Sears Roebuck, but due to the lapse of option on the Rotorite patents by the Levine interests, the mail order company was left without a source of supply in 1929. When Sunbeam took over the Rotorite Corp. in July of that year, Sears Roebuck signed contracts with the Evansville firm to supply them with units for their electric refrigerators.

The first Coldspot refrigerators consisted of a Sunbeam unit housed in a cabinet manufactured by the Tennessee Furniture Co. Intensive production got under way in 1930 when a new evaporator was designed for the unit by Sunbeam engineers.

Other early Sunbeam-powered refrigerators were housed in cabinets made by the Gurney Refrigerator Co. and the Bohn Refrigerator Co. At present the firm builds units exclusively for Sears Roebuck, with foreign sales being handled through Sears International.

Since its entry into the field, the Sunbeam unit has undergone no radical changes. Features of the machine, according to company officials, are an overpowered unit for hot climates, tray release levers, semi-automatic defrosting mechanism, automatic domelight, stainless-aluminum untipping shelves, cold-air flue, and a vegetable storage bin.

Sunbeam claims the distinction of rising from nearly last place in point of sales in 1930 to fifth place in the industry.

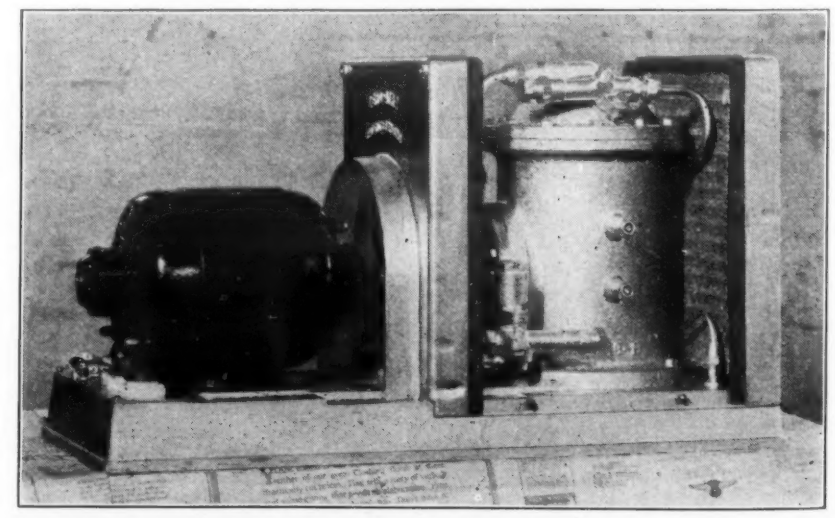
Sanitary Started in Ice Box Field

After several years in the ice refrigeration industry, the Sanitary Electric Corp. of Fond du Lac, Wis., turned to the manufacture of electric refrigerator systems and cabinets in 1926, when the first Sanitary Electrics were installed. The first units were developed by B. K. Miller assisted by H. B. Miller; they are still associated with the company.

The Standard Hermetic Unit, involving a magnetic pressure unloading valve, was invented in 1926 by Mr. Roll, present plant superintendent of the corporation.

The Sanitary Electric Corp. has pioneered many design improvements for the refrigerator cabinet, according to company officials, one of the most noteworthy of which is the removable base construction used in present-day Sanitary Electrics.

First 'Zeroaire' Machine



The first machine built under the Rotorite patents, sold under the name "Zeroaire" in 1928. In 1929, Sunbeam Electric Mfg. Co. bought Rotorite Corp., and began manufacture of refrigerators for Sears, Roebuck & Co. The present Sears Coldspot machine is a refinement of the unit shown.

Copeland, One of Oldest Names In Industry, Was Training Ground For Many of Today's Leaders

The name "Copeland" in the refrigeration industry is symbolical not only of a number of pioneer engineering developments and refinements, but it also stands for an organization in which many of the pioneer engineers and executives of the industry have been trained.

The Copeland Co. was founded by Edmund J. Copeland, who started experimenting with plans for a household electric refrigerator as early as 1913. His connections at first were with the company from which the present Kelvinator Corp. has sprung. (For an account of this, see the story dealing with Kelvinator's history on page 8.)

Mr. Copeland is given credit for developing the "first successful automatic refrigerator" for the home. It was the fifteenth model which he worked on (and the first one that was successful from the standpoint of automatic operation).

This model was discovered in 1933 in the home of Joseph Schlacks, Grosse Pointe, Mich., and was sent to the Smithsonian Institute, National Museum of the U. S. Government in Washington, D. C.

"I got into the electric refrigeration business by accident," Mr. Copeland once said, "and eventually invested so much money in development work that I had to stick with the accident."

Controls Hardest Problem

The two most difficult devices to perfect in his work on an automatic household electric refrigerator, Mr. Copeland said, were the thermostatic control and the compressor seal.

About $125,000 was spent in developing the control, he declared, and that was done only after companies like General Electric, Minneapolis Regulator, Fulton Sylphon, Johnson Regulator had failed (at that early date) to produce a satisfactory control.

In 1923 Mr. Copeland started his own company under the name of Copeland Products, Inc., locating in Flint, Mich. At that plant the refrigerant "isobutane" was developed for household refrigeration, with the assistance of Harry Edwards of Union Carbon & Carbide Corp., well-known authority on refrigerants.

The company outgrew its plant facilities at Flint and was moved to Mt. Clemens, Mich. Mr. Copeland ended his connection with the firm somewhere along about 1928.

Copeland Joins Leaders

Aggressive management and a hard-hitting sales organization pushed Copeland into the spotlight rapidly; by 1926 the company was recognized as being in the first eight in the household refrigeration field.

Many well-known names in the industry either had their start with the Copeland organization, or have worked with the company at some time during their career in the industry.

A chart of the organization's executive personnel in 1930 reveals a whole host of familiar names. President of the company was Louis Ruthenburg, who had joined Copeland after a career as a successful executive in the automotive field. He later was consultant to the Refrigeration Division of Nema, and is now president of Servel, Inc. It was Mr. Ruthenburg who developed the Mt. Clemens plant to a high degree of productive activity.

McElhinny Vice President

Vice president in charge of sales was the late dynamic W. D. McElhinny. Lawyer, journalist, and war aviator, he was probably the most volatile orator the industry has ever known, and one of its best story tellers.

It was McElhinny who, turned refrigeration salesman after the war, sold refrigerators to Pierre du Pont and John J. Raskob, General Motors officials, and some believe that it was the interest he generated through these sales that was a factor in General Motors buying Frigidaire Corp.

"Mac" started and ended his career in refrigeration with Frigidaire, but sandwiched in a period with Copeland, during which time he was said to have been one of the most highly compensated men in the industry, receiving a commission on every Copeland unit sold.

Holding the title of sales manager at the time was C. W. Hadden, who is now active in the management of Kelvinator of Canada, Ltd.

Bogue Headed Commercial Sales

In charge of commercial sales was A. L. Bogue, who had started in with Kelvinator during 1926 in the advertising department, joining a group that included George Moister (now Universal Cooler's advertising manager); George Whitney (now with the Norge advertising department); and Ralph Douglass (later Copeland's advertising manager).

Chief engineer of the company was the veteran designer John R. Replogle of whom more will be found elsewhere in this issue. His assistant for many years was H. R. McPhail, now prominent in the Norge engineering department.

Heading Copeland's service department was Harry Newcomb, at present head of the Servel commercial refrigeration division. Another former Copeland man now doing field sales work for Servel is H. T. Kessler, manager of the Chicago branch at the time.

Commercial engineer for the branches was H. A. Brysselbout, now with York. Works manager was the late Ed Hughes, who left Copeland to join Norge. Assistant works manager was Ed Barger, a veteran engineer who has since been connected with Kelvinator and Universal Cooler.

Winslow Buys Company

The company ran into financial difficulties in 1932, and after considerable manoeuvering on the part of financial interests, was sold to Dallas E. Winslow in 1933. The executive personnel mentioned above as being active in 1930 for the most part left, or had left the company, and a new executive staff took charge, and the plant moved to the Lincoln Motor Car Co.'s former Detroit plant, which Winslow owned.

W. G. von Meyer, a real industry veteran (see picture and caption on page 20), was placed in charge of sales, and is now vice president. Many of the sales and engineering personnel were drafted from the old Zerozone Corp., which Winslow had also purchased. (See Zerozone story, page 15.)

Veterans on Staff

However, Copeland has a number of real veterans among its plant executive personnel including A. G. Watkins, traffic manager, who has been with the company for 12 years; Frank Gander, assembly chief, who started with Kelvinator in 1920 and joined Copeland in 1923; Roland Job, household refrigeration production foreman, joined the concern the year the plant was moved from Flint to Mt. Clemens; and Albert Shaw, chief inspector, who was educated in English technical schools and who joined the company about seven years ago.

The Copeland company lays claim to many "firsts" in engineering and sales developments. It was first to use rubber ice cube trays, first with double depth trays, first with a water-chiller, first with electrically lighted cabinet interiors, and first with colored tops.

Copeland Developments

It was one of the first companies to merchandise refrigerators through radio retailing establishments, and was first to hold a sales convention in an air-conditioned field.

In the field of commercial refrigeration Copeland was the first to adopt the refrigeration fin coil evolved by Lester Larkin, who had developed the design while putting fin coils on brine tanks to overcome the frosting problem which confronted commercial installation engineers in the south. The company was also the first to introduce a 3-cylinder compressor.

Among the more recent Copeland engineering developments is a lubrication system which is said to increase compressor efficiency.

Potter Developed Two-Compartment Household Model

While president of a New York engineering development firm in 1936, T. Irving Potter, president of the Potter Refrigeration Corp., Buffalo, N. Y., became interested in refrigeration and began the manufacture of commercial refrigerators in a small factory at Portland, Ore.

After several years of building and marketing dry-cold commercial units, Mr. Potter began experiments with the elimination of dehydration and shrinkage of foods placed in commercial boxes using the dry-cold principle, through the use of the fin-type coil.

His experiments convinced him that temperatures essential to efficient refrigerating results with a minimum of dehydration could be produced by use of the fin-type coil, and he adapted it as standard equipment on his commercial line about 1928.

During the same year, he began manufacture of a line of household electric refrigerators using the two-compartment storage idea. One compartment was used for preservation of foods at electric refrigeration temperatures and the other was called the "Frozen Storage" compartment, in which foods needing very low temperatures for proper preservation, were stored.

While developing what he calls his "Air-Conditioned" refrigerator, Mr. Potter placed his products in about 200 kitchens of business associates.

In 1932, distributing activities of the Potter Refrigeration Corp. were moved to Buffalo, N. Y., where the firm name was changed to the Tricold Refrigerator Corp. and the new lines of Tricold and Childare refrigerators introduced following advertisement of the fact to the industry in a 20-page "spread" in AIR CONDITIONING AND ELECTRIC REFRIGERATION NEWS then known as ELECTRIC REFRIGERATION NEWS.

Mr. Potter applied construction ideas of his own to the Tricold and Childare lines, featuring the Frozen Storage compartment. Units for the line were made by the Universal Cooler Corp. in Detroit and installed there in cabinets manufactured by Rex.

Buffalo, N. Y., has remained the distributing center for the Potter.

Cabinet Engineer

T. IRVING POTTER

TIME PAYMENT FINANCING THAT *Promotes* SALES

FOURTEEN MILLION HOMES still lack automatic refrigerators.

Twenty million homes haven't the comfort and convenience of the million or so that have oil burners.

Adding to these the tremendous sales possibilities still in sight for washing machines, radios, cooking ranges and other domestic electrical equipment, there is a potential multi-billion dollar business awaiting energetic, progressive manufacturers, distributors and dealers.

Estimating conservatively that more than half of it must be sold on time payment plans, the vast importance of a sound, low-cost time financing service as an aid to sales isn't even debatable.

Commercial Credit offers a plan that is easy to sell to a finance-wise public. It is backed by a nationally known company with a record of success in handling more than $600,000,000 of receivables and time payment financing in the past year. It is administered by an experienced personnel, trained to serve with promptness, efficiency and courtesy in every phase of its dealings.

A telephone call or a letter to the nearest of our 171 offices will bring a staff representative for consultation on financing, without cost or obligation.

COMMERCIAL CREDIT COMPANY

COMMERCIAL BANKERS
CONSOLIDATED CAPITAL

HEADQUARTERS: BALTIMORE
AND SURPLUS $49,000,000

FINANCING SERVICE FOR MANUFACTURERS, DISTRIBUTORS AND DEALERS
THROUGH 171 OFFICES IN THE UNITED STATES AND CANADA

Policy of Low Prices Brought Rapid Success for Crosley, Pioneer of the Gadget Era

Pioneer in the automotive and radio industries, Powel Crosley, Jr.'s, comparatively late entrance into the field of electric refrigeration (1932) might seem to disqualify him for that title in the refrigeration industry—yet he is generally credited with ushering in and "pioneering" a new era in household refrigerator construction and merchandising—the "gadget" era—through the introduction of the Shelvador feature.

Born in Cincinnati in 1886 the son of a prominent attorney, Powel Crosley's story has been one of a long battle against adversity and a driving through to the perfection of plans and products which were his own.

He studied mechanical engineering and law at the University of Cincinnati, but his heart wasn't in it—he wanted to get into the automotive field. His father gave him neither help nor encouragement, but he jumped into the industry anyway in 1909, organizing a company to make a car to sell at less than $2,000. Lack of capital doomed the plan to failure.

He then almost embarked upon a career as an automobile racing driver, but on the eve of the first Indianapolis Speedway race, in which he was scheduled to drive, he broke an arm.

Crosley then joined a motor company as advertising manager, and sometime later headed up an auto distributing firm in Muncie, Ind. He still wanted to be an automobile manufacturer, however; in 1912 and again in 1913 he made attempts to form manufacturing companies, but in both cases lack of adequate financing forced him back.

Followed in quick succession two more jobs, both in the advertising line. In the fall of 1916 he started a mail order business for one of the clients of the firm for which he, himself, was then working. This client was selling automobile specialties.

In 1917 Crosley bought him out. The business, under Crosley's management, developed rapidly. In two years its sales rose to over $1,000,000. Its growth necessitated larger quarters.

Powel Crosley, Jr., bought out the National Label Co. of Cincinnati, and in this establishment printed all of the advertising matter he needed for his automobile specialty business. He then bought another building, which he converted into a wood-working factory in which he made phonographs.

Until the year of 1920, the phonograph business grew and prospered. A deflation of prices came at this time, however, and with it a curtailment of demand for phonographs.

And then, quite by accident, the big opportunity of his life, the one opportunity that has put him in the millionaire class, presented itself.

Early in 1921 his son, Powel III, then nine years old, became interested in radio. Mr. Crosley took him over to the Precision Equipment Co. to look at some radio sets. The prices seemed prohibitive. He was offered a small one-tube receiving set for $130.

A rather expensive toy for a boy of nine years, he thought. And thinking, he conceived an idea; why couldn't he manufacture radio sets at more reasonable prices?

He purchased a practice key and buzzer for his son and a book entitled, "The ABC of Radio." Reading this—it was filled with such mystifying terms as antennae, condensers, capacity, inductances, grids, plates, phones, and B batteries—he returned to the store and bought a crystal set with hay wire antennae.

"Every 'rock crusher' (amateur's term for broadcasting station) around town came in like a ton of bricks," Mr. Crosley remembers. "But we couldn't get any music; not even phonograph records. So we added an audio detector, and—will marvels never cease—we heard music from a distance of seven miles!

"Finally we bought a three-barreled multi-control set equipped with all the modern improvements, excepting hot and cold running water. When the wind was blowing in the right direction we frequently heard Pittsburgh with this outfit."

Cost of this receiver, with the audio amplifier required, was upwards of $200. Experimenting with radio parts to determine the simplest layout and construction developed the fact that the performance of this elaborate outfit could be duplicated with an assembly of equipment costing about $35 retail.

Powel Crosley, Jr., decided to build radio apparatus, to sell at moderate prices, in his wood-working plant in which he had built phonograph cabinets.

Soon after Mr. Crosley entered the radio manufacturing field, he became aware of the fact that if people were to buy radio sets, it would also be necessary to furnish them with high-class entertainment to listen to.

In the early spring of 1921, he started with his first experimental broadcasting station, a small affair which he constructed in his own home, and which was operated with call letters CR. Here his experimental work continued steadily and in March of the following year, 1922, the first license under the call letters of WLW was issued.

Some eight or nine years ago, Mr. Crosley turned his attention to electric refrigeration. He wanted to produce a good electric refrigerator that could be sold at a price.

Crosley electric refrigerators were first introduced in the spring of 1932. Shortly afterwards the Shelvador feature was added, and each year their sales have been double those of the preceding year.

To meet the demand in 1935, production facilities were increased to 2,000 refrigerators a day.

The story is told of how Crosley research engineers, having worked for two years on a refrigerator, at last showed him the finished product.

"How much?" he asked first.

They quoted him a cost that would have required him to sell the refrigerator for $187.50.

"You can throw it in the ashcan," Mr. Crosley told them.

Meanwhile another manufacturer, now out of business, had entered the market with a refrigerator selling under $100.

"Here is what I want," Mr. Crosley told his engineers. "How much would it cost you to buy the compressor in this machine?"

The answer was $5.00.

"Then you can make it yourselves for $3.00," he said.

He analyzed the competitor's machine, part by part, and added the total cost. It was low enough to permit a retail price of less than $100.

"Here it is, then," Mr. Crosley said to the engineers. "I'm not giving you two years, but two weeks, to show me the machine in operation."

In the specified time they came through, and the refrigerator was soon on the market.

Pendergast Helped Design Low-Priced Absopure Unit

With a record of 13 years of service in the sales, engineering, and service branches of the industry, first with Iceless Refrigerating Machine Co., next with Absopure Refrigerator Corp., and last with Universal Cooler Corp., where he is now manager of commercial equipment sales, Thomas Pendergast has a real stake in the pioneering of refrigeration.

Mr. Pendergast entered refrigeration in 1923, joining the Iceless Refrigerating Machine Co. as an engineer and machine designer. When the company was sold to Absopure, in November of 1925, he went with that company, in its engineering department.

In 1927, General Necessities Co., of which David A. Brown was president and general manager, and the late Harry C. Hayes chief engineer, purchased all assets of the Absopure Co., and it became known as the Absopure Frigerator division of the parent company.

By this time Mr. Pendergast had added commercial sales and national service duties to his engineering responsibilities.

Collaborating with Mr. Hayes, Mr. Pendergast had an important part in enabling Mr. Brown to realize his dream—a household electric refrigerator aimed at the low-price volume market; one that could be sold in the price range of around $150.

Introduction of this machine, however, was hampered by the now-famous suit brought by Frigidaire against General Necessities over the Wolf patent, and subsequent financial difficulties for Absopure.

For a time, Mr. Pendergast managed the Absopure plant for the trust company which had taken over the receivership. When the Absopure interests were purchased by Universal Cooler Corp. in April of 1931, Mr. Pendergast joined that company, where he was placed in charge of sales of commercial refrigeration equipment.

He has been in charge of that branch of the company's operations ever since that time.

Significant Steps in Sales Promotion Are Reviewed by Garceau

John Garceau of Kelvinator Corp., who will soon be entering his tenth year of service in the refrigeration industry, has had a part in the "pioneering" of new sales and promotion ideas in the refrigeration industry and is now doing similar work in a new branch of the industry—air conditioning.

Garceau came to Kelvinator in 1927 as assistant to J. Allen Corcoran and Ralph Douglass, serving successively as assistant advertising manager to Corcoran and Earl Lines until he was transferred to the sales department as assistant to Vance C. Woodcox, for the purpose of forming a sales promotion division.

When Woodcox became director of advertising and sales promotion Garceau became his assistant until the Chicago A Century of Progress exposition came along. He went to Chicago to install and operate the company's exhibit during the second year of the World's Fair.

Upon his return to Detroit, he took over the responsibility of the advertising for the newly created air-conditioning division. Later he was placed in charge of advertising for the standard commercial and automatic heating lines.

Garceau believes that the evolution of the present-day, well-planned coordination of local and national advertising is one of the most significant developments in refrigeration advertising.

"In the early days of electric refrigeration advertising, it seemed as though manufacturers, distributors, and dealers alike, refused to profit by the experience of manufacturers and retailers in other fields of specialty selling and merchandising," he explained.

"The sewing machine, cash register, automobile, and even the then-infant radio industry, all presented an open book for any who cared to profit by eliminating fundamental mistakes from advertising and selling.

"Instead, it seemed we all had to persist in selling the novelty of 'mechanical' ice. Then followed a period of appealing to pride of possession.

"Formation of the Electric Refrigeration Bureau and resulting cooperative campaigns marked the first real graduation into the *value* theme, with health, convenience, economy of operation, and food savings, appearing more and more in advertising copy and selling arguments.

"From that point on advertising really started to do a job for dealers and salesmen, and to me the most interesting part of the evolution of refrigeration advertising had started to take place.

"It came about in the form of a better understanding of the necessity of applying local sales promotion plans to capitalize on national advertising.

"In Kelvinator's case it came about with the formation of a separate sales promotion department made up of a group of young advertising and promotion men with field experience. Those who did not have such a background were immediately put into the field to get practical experience.

"That, to me, is the most outstanding development in refrigeration advertising—the complete tie-up of national and local advertising in one unified program."

DURAFLEX BELLOWS

THE development of Duraflex Bellows for expansion valves and controls constitutes another important advance in the progress of refrigeration. It has added materially to the service life and reliability of these valves and controls.

The special alloy used in the Duraflex Bellows has proved its ability to retain its elasticity and density under the severe conditions imposed by refrigeration longer than that of any other material available.

Duraflex Bellows are seamless. A flat disc of Duraflex special alloy is subjected to a series of drawing operations in which it is first cupped and then gradually drawn into a long, thin, hollow cylinder with an integral bottom. This cylinder is put through a sequence of spinning operations which bring the bellows into final form for use in expansion valves and controls.

Spinning a Duraflex Bellows

Drawing the hollow cylinder preparatory to spinning

DETROIT LUBRICATOR COMPANY
DETROIT, MICH. U. S. A.
5900 Trumbull Avenue
NEW YORK, N. Y.—40 West 40th St. • CHICAGO, ILL.—816 S. Michigan Ave.
LOS ANGELES, CALIF.—320 Crocker Blvd.
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
Canadian Representative—RAILWAY AND ENGINEERING SPECIALTIES LIMITED, Montreal, Toronto, Winnipeg

DICELER

PIONEERS with FOUR CYLINDER REFRIGERATION COMPRESSORS

The most complete line of condensing units for Methyl-Chloride, Freon and Sulphur Dioxide. From 1/6 to 30 H. P.

Write for interesting new catalog

DEISSLER MACHINE COMPANY
GREENVILLE, PA., U. S. A.
Export Department, 100 Varick Street, N. Y.

Blood, Donaven, & Knapp Organized Norge Corp. in 1927 to Manufacture Rollators; Still Hold Norge Executive Posts

Howard E. Blood, president of the Norge Division, Borg-Warner Corp., Detroit, and first vice president of Borg-Warner Corp., entered the electric refrigeration industry in 1924 when he adapted the Rollator rotary compressor for use in the Norge household electric refrigerator.

As a boy, Mr. Blood was very much interested in machinery and worked in the Blood Bros. Machinery Co., Kalamazoo, owned by his father and uncle.

He was graduated from the University of Michigan with a degree in mechanical engineering and began to sell the universal joints manufactured by his father.

After the world war, in which he was made a major in the air service in recognition of his work in building and equipping McCook Field for engineering and development work, Mr. Blood went to the General Motors Co. in Walkerville, Ont., Canada.

Donaven and Knapp Join

With him were C. D. Donaven and John H. Knapp, and these three formed a triumvirate that has been together ever since. Mr. Blood remained in Walkerville for four years. having charge of the construction and management of the General Motors Corp. of Canada.

Blood, Donaven and Knapp joined the Detroit Gear & Machine Co. when that concern was on the verge of failure.

In the winter of 1924-25, Mr. Blood paid a visit to E. E. McMullen in St. Louis and while there was shown the rotary compressor that is the basis of the Norge unit today. He took great interest in the machine and brought a model back to Detroit with him.

For a year he and his associates worked on the improvement of the device, and the first year of production turned out 110 units which were installed in various homes in Detroit and St. Louis.

Partners Control Company

When their successful operation had been demonstrated, Blood decided to make a thousand more but the directors of the Detroit Gear & Machine Co. decided to have nothing to do with the compressors. Not wishing to see the device shelved, Mr. Blood and his partners obtained an option on all of the common stock of the company and continued to manufacture refrigerators at their own risk and expense.

In January, 1927, they organized the Norge Corp. to take over all of the common stock, the trio retaining control. From that date the company grew until in 1929 the Borg-Warner Corp. offered to absorb them.

Since by so doing they could have much greater financial backing, Blood, Donaven and Knapp accepted the proposal. Mr. Blood remained in charge of the Norge division and was also elected a director of the Borg-Warner Corp.

Blood Made Borg-Warner Executive

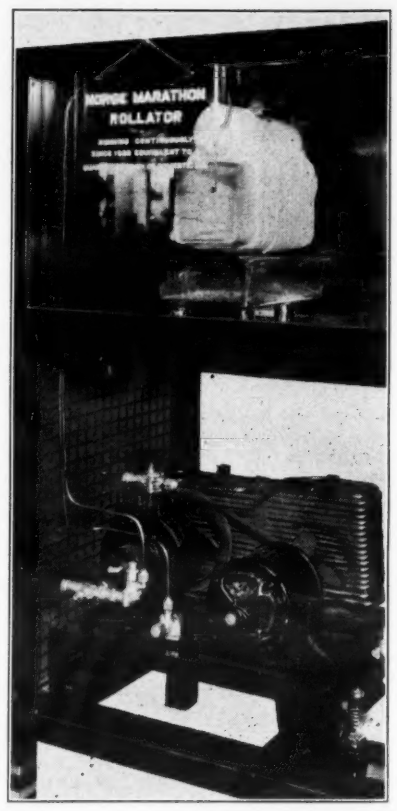
In March, 1932, at a meeting of the board of directors of the company, Howard Blood was promoted to the position of first vice president of the Borg-Warner Corp.

The Norge output for 1931 had been three and a half times greater than that of 1930. In October, 1931, Norge bought the Alaska Refrigerator Co. of Muskegon, Mich. That company had been manufacturing cabinets for Norge for about six years but could not supply enough to meet the new national demand. Norge took over the Alaska Co.'s factory and commenced making its own cabinets.

Under the active leadership of John Knapp, vice president in charge of sales, Norge distributing outlets had increased by leaps and bounds.

Nation-wide surveys among customers, dealers and salesmen were instituted in 1932 by Norge to accumulate data concerning the refrigeration industry which would serve as a guide for the company. Two casts of actors were engaged the same year for a country-wide tour sponsored by the Norge Corp. in connection with their advertising campaign.

Norge produced a great many more commercial refrigerating units in 1933 than it had in the preceding years. This move was followed by the company's entrance into the electric washing-machine field in 1934.



Probably the most famous of the Norge compressors ever built is the Marathon Rollator shown above. This machine has been in operation continuously since 1926, a running time which the company claims to be equivalent to a quarter century of domestic service.

Norge compressors in 1926 were built by Detroit Gear & Machine Co.; but shortly after, in January, 1927, Howard E. Blood, C. D. Donaven, and John H. Knapp organized Norge Corp. to handle refrigeration.

Dealer Reverses the Usual; Entertains Distributors

BUFFALO—When a dealer entertains his distributors, that's news. Believe it or not, Ben Melzer, local Crosley dealer, was host at his home recently to the distributors of the various products he handles. George Eckel, sales promotion manager, attended as representative of Ontario Electric Co., Crosley distributor here.

Zerozone Was Training Ground for Many Sales and Engineering Executives Prominent in Industry Today

Like many another company that was in the electric refrigeration field "early" in its history, Zerozone Corp. was a training ground for a number of pioneer engineers and executives who now hold responsible positions with other companies.

This was brought to light in the story of Zerozone's history as told by Paul A. Lovegren, one of the founders of the Zerozone company, and now purchasing agent for Copeland Refrigeration Corp.

Founders of Zerozone

Zerozone Corp. was founded by C. E. and S. R. Jernberg, O. H. Anderson, and P. A. Lovegren. These men were operators of the Iron Mountain Co., a machine shop on 95th St., Chicago, which had specialized in automotive and die work. They also had done some work for an ice machine manufacturer, which got them interested in refrigeration manufacturing.

In 1922 the Zerozone Corp. was brought into existence, and the first unit Model "S," a ¼-hp. unit, was introduced. This was for household refrigeration, but was used chiefly in modernizing old iceboxes, in many cases being used in apartments on multiple hookups. It wasn't long before self-contained models were introduced, Seeger, Rex and Rhinelander cabinets being used.

William E. Bihl was the first chief engineer, and according to Mr. Lovegren he was responsible for several engineering developments now generally used. Mr. Bihl had patents on the Zerozone thermostatic control, and was, so says Mr. Lovegren, the first to introduce a cold control showing which way to turn the controller towards a point marked "colder." The onetime Zerozone chief engineer is now with a Pacific Coast refrigerator manufacturer.

First assistant to Mr. Bihl was Axel Ramclaw, who later developed the Zerozone commercial refrigeration line, marked by the large flywheel and other distinctive design features. The commercial line was introduced in 1926.

Mr. Ramclaw now heads up the engineering work for the Mills Novelty Co. compressor division.

Head of Zerozone's service department was R. E. Polley. Mr. Polley was with the company from the beginning, having done service work on the Nokol oil burner, which the Iron Mountain Co. made, before getting into refrigeration service work.

Mr. Polley is now well-known throughout the industry as the head of the Mills Novelty Co. refrigeration department.

Hall Started with Zerozone

Joining Zerozone Corp. in 1928 as a research engineer was Perry Hall, a graduate of Armour Institute of Technology. In 1932 he become chief engineer of the company. He did much of the research work and collaborated on such development as the simplified flapper reed valve as used extensively now on discharge valve plates; the Zerozone low side float which is said to have been one of the best of its type; designs for a balanced seal; use of hand-lapped pistons and elimination of the piston ring.

Mr. Hall is now chief engineer of Copeland Refrigeration Corp. In his new position among his principal achievements have been the redesigning of the entire commercial line for use with methyl chloride, and the specifying of key data for its use in any type of application; and the design of special units for ice cream work.

John Newstrom was the Zerozone shop superintendent. He headed up what Mr. Lovegren terms "a bunch of high-grade Swedish mechanics."

A high-grade Swedish engineer who joined the Zerozone concern in 1931 to do design work was George O. R. Lindgren, who had mechanical and electrical engineering degrees from the Government College at Orebro, Sweden, and who had studied electric refrigeration in a course offered by the Commonwealth Edison Co. of Chicago to its employes.

In 1933 Mr. Lindgren was appointed supervisor in charge of production and design. While in this capacity he had a hand in many engineering developments, among them being the balanced seal design, improvements in float valves, and in reed valves.

He is now factory superintendent of Copeland Refrigeration Corp. in charge of production and design. He was responsible for, and has patents pending on, the new method of lubrication of pistons and piston pins in the 1936 Copeland compressor by means of oil circulating in the system.

The Sales Force

J. M. Stoerkle was the first Zerozone sales manager. He was followed by L. C. Keeley, who became vice president in charge of sales.

Mr. Keeley is now head of the Chicago branch office of the Seeger Refrigerator Co.

During Keeley's reign as sales chief R. A. Berg joined the sales staff, working in the Chicago division office. Chicago was one of Zerozone's three big sales areas—the other two being in the Newark, N. J. territory and the West Coast. According to Mr. Berg, 1929 was Zerozone's big year, with sales going over the million dollar mark.

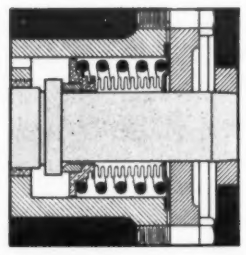
Mr. Berg is now with the sales department of Copeland Refrigeration Corp.

Succeeding Mr. Keeley as head of Zerozone sales was E. R. Lovegren, cousin to Paul. He was later with General Electric and Westinghouse refrigeration sales organizations and is now with Norge.

Zerozone, in addition to building a distinctive type of unit to sell under its name, also built the original units for such firms as Illinois Moulding Co. (King Kold), Stewart-Warner, Starr-Freeze, and Mills Novelty.

The company suffered financial difficulties in 30's, finally going into receivership. It was purchased by Dallas E. Winslow in the early part of 1934 and is operated as a going concern, although more or less as a subsidiary of Copeland.

BRUNNER'S "BALANCED SEAL" IS *Leak Insurance*



The diagram to the right shows, in blue print style, how Brunner engineering prevents leaks at one of the most vital points in mechanical refrigeration: where the crankshaft inserts into the crankcase. A unique, accordion-like sealing device is so designed that a constant pressure is exerted on the seal nose regardless of the crankcase pressure. Leakage is positively prevented, no matter if the inside pressure is greater or less than atmospheric pressure. Think of this advantage in terms of safety and economy! Get the full mechanical details of Brunner's "Balanced Seal" and companion features. See why Brunner is "The Fastest Growing Name in the Industry". Brunner Refrigerating and Air Conditioning equipment ranges from 1/4 H. P. to 15 H. P.—forty-seven condensing units, and five compressor models, air and water cooled. Catalog on request.

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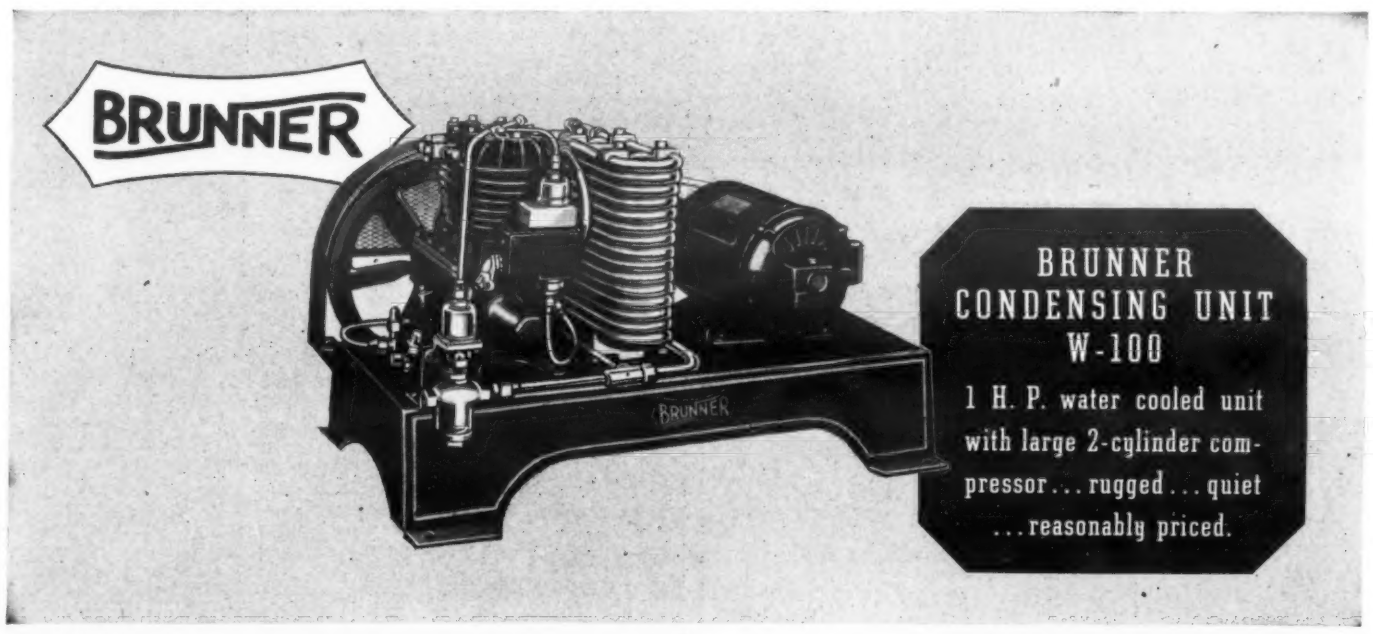
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BRUNNER
BRUNNER CONDENSING UNIT W-100
1 H. P. water cooled unit with large 2-cylinder compressor... rugged... quiet ...reasonably priced.

BRUNNER CONDENSING UNITS and COMPRESSORS

Lacy Active in Making Methyl Chloride As Commercial Refrigerant for R & H; Sales Promoted by Thomas Coyle

Intensive practical development of methyl chloride as a refrigerant dates from 1920, according to the R. & H. Chemicals Department of E. I. Du Pont de Nemours, Inc., manufacturer of methyl chloride gas for refrigerating systems.

Although methyl chloride was discovered in 1835 by a pair of French chemists, Dumas and Peligot, no actual manufacture of the gas in commercial quantities was undertaken until 1875, when it had a limited use as a refrigerant on French battleships where high standards of safety were demanded.

Fundamental research on methyl chloride was begun in 1910 by the Roessler and Hasslacher Chemical Co., which later became the R. & H. Chemicals Department of Du Pont.

Dr. B. S. Lacy and his associates were assigned the task of creating a commercial manufacturing process for methyl chloride. Only a small amount of research material on the subject was available. Consequently Dr. Lacy and his assistants started practically from scratch, and it was not until 1918 that methyl chloride was produced on a commercial scale for the company.

Sales Started in 191

Marketing of the gas as a refrigerant was withheld by R. & H. Chemicals until reliable data on the physical, chemical, and thermodynamic properties of methyl chloride, together with toxicity data, were secured. By 1919 the company's production facilities, under the supervision of P. J. Carlisle, were expanded sufficiently to warrant commercial sales.

First compressors on the market to use "Artic," as the special refrigeration grade of methyl chloride produced by R. & H. is known, were made by the Zanesville Engineering and Equipment Co., Servel, and Icemaster. The latter two companies still use this refrigerant.

For several years, sales of small compressors were limited, and Thomas Coyle was assigned by the company to aid commercial development of methyl chloride. To achieve commercial production according to company standards, several difficult situations regarding safety regulations in installations had to be met. Mr. Coyle, who had long experience with refrigeration safety codes, was chiefly instrumental in solving these problems, according to the company.

Mr. Coyle is manager of chlorine product sales for Du Pont. He was graduated by Lehigh University in 1909, receiving his degree in chemical engineering. He is a member of A.S.R.E., Compressed Gas association, and Chemists Club of New York.

Worked With Manufacturers

R. & H. technicians worked in cooperation with development engineers from several leading refrigerator companies during the early years of electric refrigeration's history to meet such problems connected with the use of methyl chloride as lubrication and the development of oil with the proper viscosity, pour point, chemical stability, etc.

New types of gaskets, demanded because the solvent properties of methyl chloride differed from older refrigerants, were developed by R. & H., together with new methods of leak detection. Company technicians worked out standards for suitable drying agents for refrigeration systems and recommended them to the industry.

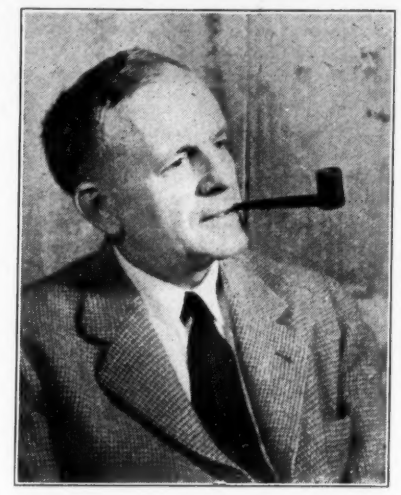
Working in conjunction with outside laboratories, R. & H. carried on research concerning the harmlessness of exposing furs, flowers, textiles, foods, beverages, and other material to methyl chloride in case of accidental leakage. Accurate determinations on the toxicity and fire hazards of the gas were made by non-commercial laboratories at the request of the Du Pont subsidiary, and were placed in the hands of the Bureau of Mines and Underwriters' Laboratories.

Development of Methyl Chloride A

Methyl chloride A was developed by the company as a suitable irritant for a warning agent after several years of research on odorants, lachrymators, and sternutatories. Methyl chloride A was used chiefly in multiple systems.

Artic, The Refrigerant is a volume published by R. & H. Chemicals as a standard technical data book on methyl chloride for engineers, service men, and others interested in this gas in its use as a refrigerant.

Refrigerant Expert



Dr. B. S. Lacy, who developed commercial process of manufacturing methyl chloride for R. & H. Chemicals.

Wagner Motor Used On Refrigerator First in 1919

In February, 1919, the Wagner Electric Corp., of St. Louis, Mo., designed, built, and applied its first motor to a household refrigeration unit—a ½-hp. repulsion-start-induction motor. It was an adaptation of the standard Wagner repulsion-start-induction brush-lifting motor.

With further progress of the electric refrigeration industry, Wagner, as a motor manufacturer, became concerned with the problems of starting reliability, oiling, noise. By improving the design of the brushes, brush holders, commutator bars and segments, the brush-lifting mechanism, Wagner was able to extend the life of its motors.

The average motor of 1918 was expected to withstand approximately 20,000 starts and stops. Today, the average motor is able to withstand from 700,000 to 1,000,000.

The earlier Wagner motors were lubricated by the wool-pack method, which required periodic oiling. To eliminate this and to anticipate lax care by owners, Wagner re-designed the lubrication system to use oil rings in lubricating the bearings, and oil wells of sufficient size to hold a plentiful supply of oil.

This proved unsatisfactory because there was much spilling of oil in transit. Then Wagner developed the wool-yarn lubrication system that is used in Wagner motors today.

Since 1913 Wagner has built a special line of quiet, large repusion-start-induction motors for the blower and compressor industries. When the problem of noise occurred in the refrigerating motor industry 15 years ago, Wagner adapted the construction of the large motors to the new, small type and produced a quiet-running machine.

Armstrong Started Sale Of Cork Insulation for Refrigerators in 1906

Armstrong Cork Co. of Lancaster, Pa., has sold insulation to builders of refrigerated equipment since 1906 and has long been engaged in the cork insulation field.

In 1927 Armstrong inaugurated its Life Test Room where, under accelerated temperature and humidity conditions, tests of refrigerated equipment were made which approximated a lifetime of service under the conditions encountered in actual use.

This complete testing service, available to all users of insulation made by the company, facilitated the improvement of refrigeration products by many manufacturers through changes in design or construction methods according to the weaknesses shown by the tests. It is used today.

Temlok refrigerator insulation, a fibreboard insulation made from the heartwood fibres of southern pine, was introduced by Armstrong in 1930. Temlok is furnished in fabricated sets cut to size in any thickness and is used not only in refrigerators but also in moderate temperature truck bodies.

Armstrong inaugurated the production of a new type of corkboard known as Armstrong's LK Corkboard in 1931. It is a lightweight insulator for refrigerated equipment, furnished in large sizes, and is used in display cases, ice cream cabinets and similar "heavy duty" types of refrigeration.

The latest addition to the Armstrong line of insulation products is Armstrong-Corning Wool Insulation, long, interlocked glass fibres to be furnished in the form of sealed packages, blankets, fold-bats, and in bulk or loose form for use as a fill insulation. This innovation was announced only a few weeks ago.

Eustis Twins Organized Virginia Smelting to Utilize Mine Waste

Virginia Smelting Co. of West Norfolk, Va., producers of liquid sulphur dioxide and methyl chloride for use as refrigerants in both commercial and domestic electric refrigerators, was founded about 1914 as a development of a copper and iron ore mine owned and operated by the father of the twin-brothers A. H. and F. A. Eustis, now president and secretary-treasurer, respectively, of the company.

The copper and iron ores mined from the Eustis property contained a considerable amount of sulphur, and the younger Messrs. Eustis, who assisted their father in both the mining and the metallurgical work started by him at West Norfolk in 1900, worked out the design of a plant to produce liquid sulphur dioxide.

Construction of this plant commenced in 1915 and was completed late in the same year under the direction of Charles W. Johnston, then, as now, manager of the Virginia Smelting Co.

The initial product was a commercial grade liquid sulphur dioxide, the first shipment of which went to the Westinghouse Electric & Mfg. Co. at East Pittsburgh, Pa.

First SO_2 for Refrigeration

Virginia Smelting Co. believes it was the first manufacturer in the world to produce a liquid sulphur dioxide for use in refrigeration. The original product was made on a guarantee that the water content would not exceed 600 parts per million and was called "Double Distilled" because it was produced by working over the commercial grade twice.

Further research work led to a "Triple Distilled" brand and eventually to the content of less than 30 parts per million.

A method of analysis of the refrigeration grade sulphur dioxide was developed by the Virginia Smelting Co. in its own laboratories, as were methods of cleaning and drying the steel containers in which it was shipped.

The research laboratories of the company also studied the effects of oil, air, and temperature in the compressor as well as water on the SO_2 and system, and published their results.

Adopted Ton Drums

Virginia Smelting Co. adapted the idea of shipping liquid sulphur dioxide in ton drums on railroads and was among those concerns which requested the Interstate Commerce Commission to class the multiple unit cars on which the ton drums were shipped as tank cars.

A few years ago the company, after laboratory research, produced a methyl chloride for use as a refrigerant which was named "V-Meth-L."

A. K. Scribner, who has been with the firm since 1921 and who for some years has been assistant manager, directed much of the research work on this methyl chloride and later designed and supervised the construction of the plant in which it is now made.

A. H. and F. A. Eustis are both graduates of Harvard University, both took post graduate work at the Massachusetts Institute of Technology, and both are still actively engaged in research for new products for the refrigeration industry.

Taylor Freezer Claims To Be First in Field

Taylor Freezer Corp. of Beloit, Wis., manufacturer of ice cream counter freezers and hardening cabinets, was the first company in the field, according to Charles Shaw, advertising and promotion manager of the firm. In 1926 Charles Taylor made his first counter freezer in Buffalo, where he did experimental work.

For a short time Taylor Ice Cream Makers were made in Buffalo, but, as the demand increased a larger factory was considered necessary. Until about 1930 the Taylor Freezer was the only one on the market, but in that year a second make of counter freezer appeared, and others followed.

Originally, there was only one size of freezer and cabinet manufactured, the freezer being a 3-gallon unit, but today the Taylor line produces 1, 2½, and 5-gallon freezers, mounted individually or in any one of a large variety of cabinets.

Mechanically the Taylor counter freezer of today is but little changed from that of 1926. In appearance and in details of construction, however, marked improvements have been made.

The early counter freezers cost from $3,000 to $5,000 an installation, which included a 3-gallon freezer, one or more 50-gallon hardening cabinets and a refrigerating unit. A Taylor installation today may be purchased for as little as $800.

McCray Started in 1890 as Offshoot of Produce Business

Founded in 1890, the McCray Refrigerator Sales Corp., of Kendallville, Ind., manufacturer of commercial refrigerator cabinets, milk and beverage cooling cabinets, and ice cream cabinets, came into being as an outgrowth of the general produce business.

The late Hiram McCray and his son Elmer E. McCray, now president of the corporation, were faced with the necessity for an efficient means of saving food in order to cut down losses in their business and to protect the health of the public.

In the early '80's the elder McCray began the experimentation that led to his patent on the McCray system of refrigeration. The important feature of his system was the constant circulation of cold air through the refrigerator or cooling room, keeping the foods stored therein in good condition.

The basic patents on the first practical commercial refrigerators in which air circulation was maintained were issued to the McCrays, according to a report issued by the company at the time of Kendallville's centennial observance, May 14, 1936.

The first refrigerator built by Hiram McCray was made for his wife in a little factory building with a floor space of 2,500 square feet. It served for 37 years. The modern factory of the McCray Refrigerator Sales Corp. has a floor space of 310,000 square feet, more than a hundred times that of the first building.

In 1892 the industry was moved into new quarters, and the foundation of the new plant was laid on the present site.

Branch offices of the company have been established in Atlanta, Boston, Chicago, Cleveland, Columbus, Dallas, Detroit, Kansas City, Mo., New York City, St. Louis, Toledo, and San Antonio, Texas.

Elihu Thompson Invented Kold-Hold in 1926; Olds Aided Development

Patented Jan. 5, 1926, by Elihu Thomson, its inventor, the Kold-Hold principle of truck refrigeration has been employed by the Kold-Hold Mfg. Co. of Lansing, Mich., since November, 1932, in the manufacture of refrigeration units for motor trucks.

The present system was introduced during the winter of 1931 by the Consolidated Equipment Corp., of Greenville, Mich., and during the following year approximately 12 installations were made in ice cream trucks.

In August, 1932, the attention of R. E. Olds, now chairman of the Kold-Hold Co., was called to the truck refrigeration business of the Greenville company and investigation showed a considerable demand. Olds purchased an option on the business in order to provide sufficient capital for a display at the Dairy Industries Exposition held in Detroit in October of that year.

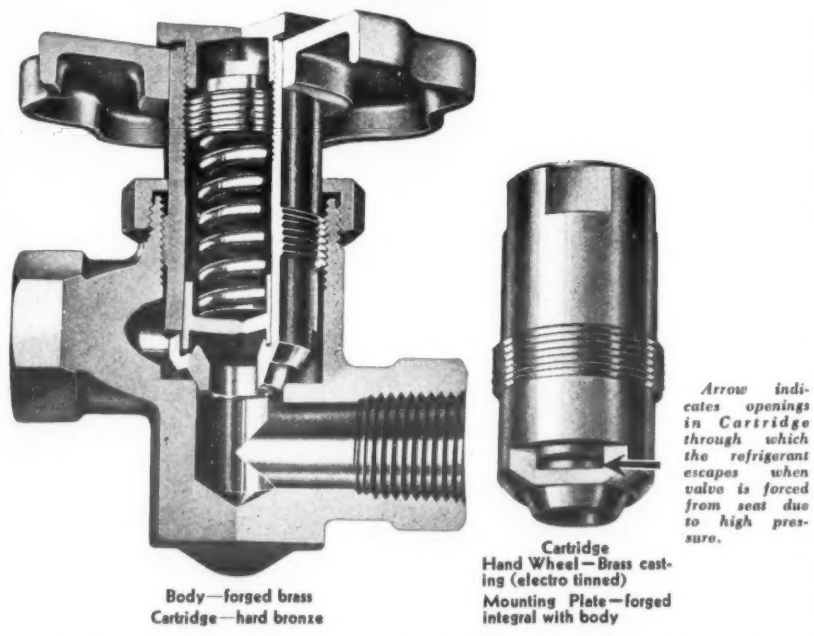
Dr. Clark W. Chamberlain, Professor of Physics at Michigan State College, Lansing, offered to furnish a cryohydrate for use as a refrigerant at any temperature desired, after it was discovered that the solution then in use was unsatisfactory.

Olds took over the business and moved it to Lansing in November, 1932. Since that time the Kold-Hold Mfg. Co. has been located in the Olds Tower building, Lansing.

Recently the company was granted a patent on an invention of Dr. Chamberlain pertaining to heat transfer methods and apparatus.

Mueller Brass Co. PRESSURE RELIEF AND EMERGENCY VALVE

(Patent Applied For)


Body—forged brass
Cartridge—hard bronze
Cartridge
Hand Wheel—Brass casting (electro tinned)
Mounting Plate—forged integral with body
Arrow indicates openings in Cartridge through which the refrigerant escapes when valve is forced from seat due to high pressure.

This pressure relief valve is set at factory to relieve at pressure specified by code.

In case of fire or other emergency when the pressure in the system is increased to the pressure at which the valve is set, the refrigerant will be automatically discharged to the outside atmosphere. In case of threatened emergency the refrigerant may be discharged manually by turning hand wheel. Opening the valve manually does not affect its adjustment.

These valves are supplied with a Duprene disc or lead alloy disc. The Duprene seat is recommended when the valve is used in Freon or SO_2 systems, the lead alloy with methyl chloride. Valves are furnished as follows:

A-13518 1/2" F. P. T. (Duprene Seat)
A-13458 1/2" F. P. T. (Lead Seat)
A-13533 3/8" F. P. T. (Duprene Seat)
A-13534 3/8" F. P. T. (Lead Seat)

The pressure relief valve is one of the latest additions to our complete line of valves, fittings and accessories for mechanical refrigeration.

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Vertical Type Unit Started Baker in Compressor Field

Manufacture of vertical enclosed single-acting type ammonia compressors was begun by the Baker Ice Machine Co., in a small Omaha, Neb., factory during 1905. The company, founded by J. L. Baker and John M. Larsen, claims to be the first firm to place this type of compressor on the market.

For several years thereafter, Baker continued making small capacity refrigeration plants for commercial purposes and developed a series of automatic controls for their products.

Among other developments which Baker pioneered, according to present company officials, are the self-contained type of condensing unit; a flooded type brine cooler using high brine velocity in connection with a short refrigerant circuit; the Baker pressure-actuated type expansion valve; the Baker-Hoffman thermal type expansion valve and liquid stop valves; a pressure-type automatic water control valve; the Baker-Hoeschen temperature control thermostat; and the Baker-Hoeschen auto power control switch.

J. L. Baker, founder of the company, recently retired from active participation in the conduct of the business. His two sons, Richard L. and Chester A., have become president and vice-president of the company, respectively. A son-in-law, Harry Kelly, is secretary-treasurer, and J. M. Fernald is general manager.

Mr. Fernald is a pioneer sales executive in commercial refrigeration work, having been with the old Nizer Company and later with Kelvinator Corp.

Besides the main plant in Omaha, Baker also maintains branch factories at Fort Worth, Tex., Los Angeles, Cal., and Seattle, Wash., and both national and foreign distributing organizations.

Alco Started to Make Automatic Expansion Valves during 1914

Alco Valve Co., St. Louis, was one of the first parts organizations formed specifically to manufacture controls for electric refrigerators, according to officers of the company. Alco, derived from the words "Automatic Liquid Control," began manufacture of constant pressure or automatic expansion valves in 1924, when the industry was in its infancy.

John L. Schrode, who has been connected with the electric refrigeration industry for the past 20 years, began experiments with constant pressure valves in the early '20's to overcome erosive and corrosive effects caused in expansion valves by refrigerants used at that time, principally ammonia.

During 1924 he developed an expansion valve which overcame cutting of the pin and seat of the valve by expansion of the refrigerant and prevented entry of the refrigerant into the evaporator when the valve should have been closed.

A discharge tube invented by Mr. Schrode which restricted the flow of the refrigerant at the pin and seat proved very successful, and the Alco Valve Co. was organized to manufacture the product in early 1924.

Since that time other control devices have been added to the company's line.

Miller Produced First Door Gasket in 1922

The Miller Rubber Gasket Co., Inc., of Akron, Ohio, professes to have pioneered the development of rubber refrigerator gaskets. The first Miller rubber door gasket designed for electric refrigerators was produced in 1922.

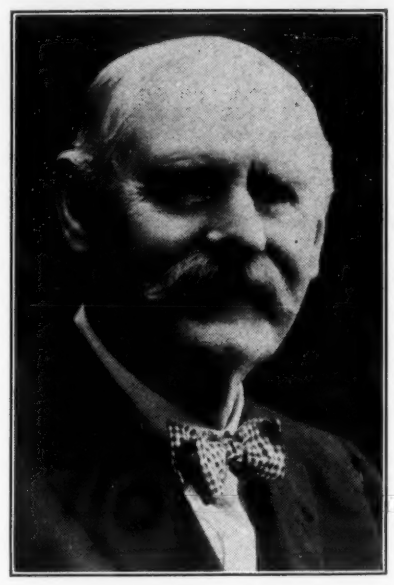
During the 14 years since that time, Miller has produced more than 2,000 different types of rubber parts for use on modern electric refrigerators, among them sponge rubber tubing for the insulation of coil lines, shelf hook shields, panel seals, shims, vibrator insulators, gliders, cabinet frames, etc.

Prior to the introduction of rubber gaskets for electric refrigerators in 1922, experimental gaskets had been given one of the large ice box manufacturers.

More than 1,000 different types of door gaskets, varying in shapes and sizes, have been designed by Miller, many of which were purely experimental. The first rubber gasket resembled the oil cloth-covered insulator which made use of a cotton core to give a certain degree of flexibility.

A recent development which will be of great value to the refrigeration industry is rubberized cork. This extraordinary material can be molded to shape as well as supplied in sheet form. Rubberized cork is unusually flexible, and enjoys long life and low thermal conductivity.

Founder Baker



J. L. Baker founded Baker Ice Machine Co. with John M. Larsen in 1905. He recently retired.

Trautwein & Hendrick Prominent in Early Carbondale History

Under its present name, the Carbondale Machine Corp. of Harrison, N. J., a unit of the Worthington Pump & Machine Corp., has been in existence since 1899. The organization's first president was A. P. Trautwein.

Trautwein, who had been in charge of installations of air-conditioning mechanisms for the Continental Iron Works of Green Point, N. Y., resigned his position with that company in 1889 and became superintendent of Hendrick Mfg. Co. of Carbondale, Pa.

E. E. Hendrick had developed and patented an absorption refrigerating machine about 1885. His invention utilized the use of exhaust steam from auxiliaries.

About the time Trautwein joined the Hendrick Co., the latter made cooperative arrangements with the American Pontifex Co., makers of the Pontifex air-conditioning mechanism imported from England. The Pontifex was not a "comfort cooling" machine, but was used only in process industries such as candy making, etc.

A refrigerating machine was developed combining some of the principles of Hendrick's apparatus with those of the English Pontifex.

The hybrid mechanism proved practical, and the Carbondale Machine Co. was formed to manufacture it, with Trautwein as president.

In one of the early installations using a Pontifex machine, that of the Hawley & Hoops Candy Works about 1888, the first system to use bunker coils and fans was included.

Mills Counter Freezer Led Company to Expand Further in Refrigeration

Ten years ago Mills Novelty Co. of Chicago saw profit possibilities in the return of ice-cream manufacture to the dealer, and production of the Mills counter freezer began.

Mills claims to have been the first major company to recognize this and to follow through with the selling of counter freezers. In 1936 the company began to manufacture its own condensing units, putting a line of commercial compressors on the market at the same time. In doing so, the company claims to be the first counter freezer manufacturers to supply their own condensing units.

The Mills company is an old one, having manufactured and sold a wide variety of mechanical articles over a period of 47 years, but its refrigeration activities assumed an important role in its business after 1926. At the present time one of the company's two plants, each of which covers a square block, is devoted exclusively to refrigeration.

Cruse Nears End of 10th Year as Case Maker

The Cruse Refrigerator Co. of Louisville, Ky., began its operations in March, 1927, as a commercial refrigerator manufacturer. A small frame building served as the first factory.

In 1928, after being incorporated, the company moved into larger building quarters. Again in 1933 the factory, offices and display rooms were moved to a larger, more modern establishment located in the heart of the business district of Louisville.

Today, the Cruse Refrigerator Co. serves many states with a complete line of freezer display counters, walk-in market coolers, Vegetaria cases, grocery and storage refrigerators.

DuPont's Dulux First Offered after Three Years of Research

E. I. Du Pont de Nemours & Co., of Wilmington, Del., makers of Du Pont's "Dulux" finish for electric refrigerator cabinets, began experimental development of their product as early as 1930, although it was not offered to the industry commercially until 1933.

In embarking on exhaustive experimental tests to develop an ideal finish for both the inside and outside of refrigerator cabinets, Du Pont research workers were given an eight-point standard, as a mark to shoot at: pure white and non-yellowing; absolutely odorless; completely protective to the metal; unaffected by deposition of moisture from warm, humid atmospheres; unaffected by oils or greases; flexible enough to withstand a severe bump; wear-resistant enough to withstand repeated cleansing over a period of years, and capable of being applied by rapid mass production methods similar to those used in the making of the boxes.

The most famous stain-resisting test applied to the Dulux finish, according to Du Pont officials, was a grease-and-exposure test carried on in Florida, when a cabinet finished with Dulux was subjected to applications of butter, bacon grease, and vegetable fats over a period of 13 months. At the end of the test, the Dulux finish was claimed to be still hard and gleaming white.

Du Pont claims the record of supplying the finish coat on 95% of the mechanical "organic-finished" refrigerators produced in the United States during 1935.

Coil Maker

T. C. Fedders is vice president and general manager of Fedders Mfg. Co., Buffalo, N. Y., pioneer manufacturers of heat transfer units. Since its beginning in 1908, Fedders has been under the direction of T. C. Fedders and L. F. Fedders, president.

It was in that year that a Fedders radiator cooled the famous Thomas Flyer which won the race around the world.

About ten years ago, the Fedders brothers realized the possibilities of electric refrigeration and began to build their line of heat exchange units for refrigeration, which has naturally been extended to air conditioning in recent years.

Today the company claims to be the largest independent producer of automotive radiators and heat transfer equipment in the world.

U.E.I. Founded in '27 As Outgrowth of Old Siebel Institute

The Utilities Engineering Institute of Chicago is one of the hundred or more schools of its kind that have come into existence during the past 10 years, paralleling the development of the refrigeration industry.

Founded in February, 1927, the U. E. I. was sponsored by officers of the Siebel Institute of Technology which, since 1873, had conducted technical advisory service to food and drink manufacturers, chiefly the brewing industry which was among the first industries to adopt mechanical refrigeration.

Some of the principles involved in the improvement of industrial refrigerating machinery were first developed by the late Dr. J. E. Siebel, scientist, founder of the Siebel Institute and author of *The Compend on Refrigeration*, used as a standard text by refrigerating engineers and in several state universities during the early part of the twentieth century.

The distinction of being the first home study school to operate on a national scale and to confine its efforts exclusively to training men in mechanical refrigeration is claimed by the U. E. I. Beginning strictly as a home study school, the U. E. I. in 1929 introduced to the refrigeration industry training service consisting of home study training combined with actual shop practice.

Laboratories containing a large variety of equipment, both domestic and commercial, were established in Chicago and later in New York City for the post-graduate training and experience of men who had completed the home training offered by the institute.

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SELLING refrigerators is more than just attractively displaying your product and setting an acceptable price. Housewives and home owners have found that value isn't simply a matter of price—value is what they get for their money. As a result, you must prove that your refrigerators will give economical and dependable service before these prospects will buy.

G-E motors on the refrigerators you sell will help you convince customers that your refrigerators are of high quality—that they are worth the price asked. For General Electric has made superior motors for many years, and General Electric's high standards of quality are known and recognized everywhere. This reputation of G-E motors will add immensely to the prestige and sales appeal of your refrigerators —will make your selling job easier.

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Forgotten Men

FASCINATING is the story of the early days of electric refrigeration as it has come across the desks of the editors of the NEWS, piece by piece, in the last two months. Undoubtedly it is far from a complete picture; many are the pieces which are missing. But much of the material has been highly revealing and profoundly inspiring—a reaction which the NEWS feels will be shared by a large majority of readers.

One observation comes to mind almost at once after reading the numerous stories of companies and individuals which appear in this issue. That is the feeling that a large proportion of the men who first caught the vision of individual refrigerating systems for homes and stores have not shared in the rewards which have come to the industry in the last several years.

True, some of these individuals who may be classed as Industry Pioneers now hold positions of responsibility and trust with important manufacturers. But many more have dropped out of sight—the Forgotten Men of the industry—and until this issue, have been unhonored and unsung.

This, of course, is a far from uncommon experience for pioneers. It is the men who *finish* jobs, who carry uncertain beginnings to successful fruition, who generally reap the harvest from seeds sown by early planters.

But the salesmen, the dealers, the distributors, the manufacturers, the executives of today, who are all so busily engaged in keeping the vigorous refrigeration industry on so high a plane of activity, may well take time out to honor the old-timers who dreamed the dreams that younger men are now making come true.

Chief among the industry's Forgotten Men are the early investors who lost money that they had so hopefully bet on a good idea. The late Col. Frank Smith, when he was president of Servel, once said: "The public paid for the development of automobiles, but not for refrigerators. Cost of developing household electric refrigeration came instead out of the pockets of stockholders, many of whom were left holding the bag."

That these early investors placed faith in a "right" idea has been borne out by the eventual rise of a mighty industry. But in the pioneering days, few foresaw the tremendous amount of experimenting and developing which would have to precede the adoption of household and commercial refrigeration on a wide scale. Small refrigerating systems turned out to be intricate, highly strung mechanisms; and their successful development provided a number of baffling problems which were a long time in the solution.

Money, and more money, had to be invested in the industry before its swaddling clothes could be removed. In this connection an amusing story is told by the chief engineer of a Detroit manufacturer regarding the financing of one of the pioneer household refrigeration companies. According to this gentleman:

"After exhausting our last dollar and a lot of money we borrowed from our friends, a Detroit bootlegger was finally sold on the idea of putting $100,000 into the venture. This gentleman had his speakeasy behind a cigar store on John R St. at Garfield. We were jubilant. The next day we went around to the bar to get the papers signed, but a half hour after our arrival the police knocked off the place, and the deal was off."

The roll of Industry Pioneers is indeed a long one. Many whose names were called did not answer. And the editors feel that there are undoubtedly many names which should be on the "roll" which have never been "registered." So many companies have come and gone, so many groups and individuals have contributed to the evolution of refrigeration products and equipment, so many men have worked on the problems, that it is well nigh impossible to get all of the pioneers together under one tent at one time.

In the Nov. 4 issue (Product Development Number) more pieces of the industry's complex history will be picked up and retailed to readers of the NEWS. Men and companies who were not represented in this issue, or whose story was inadequately told, are invited to furnish the details of their contribution to the development of the refrigeration industry for that issue.

Refrigeration has become a mighty industry. It seems due for even bigger things, with future possibilities as wide as the horizon. But it did not "just happen." This tremendous business was not at all like Topsy, who "just grew." Long ago men dreamed dreams and had visions, toiled and experimented, invested their life savings and persuaded friends to do likewise, that this industry might come into being. And now, before it becomes too late, the Newspaper of the Industry intends to place their names and achievements on record so that they may not be "forgotten men."

Letters

From a Pioneer of Cooperation in Industry

The Cromaine Corp.
1842 Wilton Road
Cleveland Heights, Ohio
Sept. 30, 1936.

Mr. Cockrell:

This is to express my pleasure in the little chat which I had with you over the telephone which afforded me the opportunity of extending my congratulations on the Tenth Anniversary of the ELECTRIC REFRIGERATION NEWS. Perhaps without your being aware of it I have been a rather consistent reader of the editorials and have scanned many articles of special interest to me over the ten year period. This has enabled me to observe the evidences of growth and success.

The delightful association of ten years ago and the adventures with you and others in laying a foundation for cooperation will always be a pleasant and happy memory. I was naturally very fully convinced at that time of the value of what we were trying to do, and I hope that the succeeding years have at least indicated that the subsequent development justified the early hopes.

I would be pleased if you would have sent and billed to me ten copies of the Tenth Anniversary Number of ELECTRIC REFRIGERATION NEWS dated Sept. 9, 1936, as I have a particular use to which I can put them.

With kindest regards.

J. ROBERT CROUSE

Du Pont Finds Charts on Industry Sales Helpful

E. I. du Pont de Nemours & Co., Inc.
Wilmington, Dela.

Mr. Cockrell:

Your recent booklet, "Refrigeration—Five Opportunities for Market Expansion," contains interesting sales charts showing the sales by years of household and commercial refrigerators.

We would like to reproduce these charts in the forthcoming issue of our house organ *Artic Service News*, and would appreciate your permission to do so. Full credit will be given to ELECTRIC REFRIGERATION NEWS.

JOHN J. LANDY, Advertising Mgr.

Answer: O.K.

New Ratings for Air Conditioning Units

Baker Ice Machine Co., Inc.
Omaha, Nebr.

Mr. Cockrell:

I am pleased to acknowledge your letter of Sept. 30, together with the copy of the 1936 SPECIFICATIONS BOOK.

In view of the present policy of the air-conditioning and refrigeration industry regarding standard ratings, I presume it will call for another issue of AIR CONDITIONING AND REFRIGERATION NEWS tabulating capacities of all units within the next few months. Unquestionably, the new standard rating tests will result in changes for almost every manufacturer.

I am pleased to tell you at this time that we have definitely decided to go in on a continuous advertising schedule in the NEWS starting right away.

J. M. FERNALD,
General Manager.

Hardy Clarifies Mixup In Mayflower History

Hardy Mfg. Co., Inc.
Mayflower Commercial Refrigeration Air Conditioning
100 Davis Ave., Dayton, Ohio

Editor:

Since your Sept. 9 issue of REFRIGERATION NEWS, we have been receiving numerous inquiries concerning our exact business and I am writing you in an effort to get the thing straightened out.

Quote: "Nov. 14. Hardy Mfg. organized to make refrigerators." Page 32.

"Feb. 19. Mayflower manufacturing and distributing turned over to founders of company, Harry J. Hunt and Fred C. Geiler." Page 34.

These statements are misleading and somewhat incorrect, and I will give you the data as it concerns our own company and you may contact the others for theirs. In the spring of 1934, Winslow, Baker, Meyering (Now Dallas E. Winslow, Inc.) bought the assets of the old Trupar Mfg. Co., makers of electric refrigerating equipment, pumps, and water softeners.

In the autumn of 1934, I purchased the commercial division of the old company from Winslow, Baker, Meyering, with the right to use the name "Mayflower" exclusively for the commercial equipment and air conditioning. This of course included the machinery, dies, fixtures, patents, etc. pertaining to these two divisions. We incorporated under the name of Hardy Mfg. Co., Inc., and have proceeded to and are still manufacturing the "Mayflower" commercial compressors and air-conditioning equipment. We are still located at 100 Davis Ave., Dayton, Ohio.

In 1935, Mr. Neff and associates bought the pump and water softener division and are incorporated under the name of Trupar, Inc., located at 420 Linden Ave., Dayton. In 1936 Mr. Harry Hunt and his associates took over the household line and are marketing a Mayflower household refrigerator in Lima, Ohio, under the name of Mayflower, Inc.

The old company seems to be like Gaul, "divided into three parts," and I hope the above information may be of assistance to you in clarifying the matter. I am not writing this as a specific "correction," but I believe this might make an interesting news item to your many readers who seem confused about who is who, and may further be of assistance to you in dealing with future news items.

HOMER H. HARDY, President.

Praise from an Editor

House Furnishing Review
1170 Broadway, New York City

Mr. Cockrell:

I want to add my congratulations for the very comprehensive Tenth Anniversary Number of ELECTRIC REFRIGERATION NEWS.

JULIAN ELFENBEIN, Editor.

P. S.—George's World Congress paper is a masterpiece!

British Finally Move To End Palestine Trouble

The British Thomson-Houston Co., Ltd.
26 Gruzenberg St.
Tel-Aviv, Palestine
Sept. 16, 1936

Editor:

I suppose you have had so many "puffs" about your articles on your travels that have been appearing in the NEWS that one more will make no difference. If by this time you have managed to keep your balance and you are not convinced about your being a rival of Marco Polo's fame as traveler, or Columbus as a discoverer or even Shakespeare as an author, then what I have to say will not hurt you.

You must be complimented upon having been able during your few days here to pick up so much information about Palestine which as a whole passed the critics here as being accurate. Where you have had more time to observe, undoubtedly this has made it possible for you to give an even more complete picture. Anyway, it all has been very interesting reading, even to those of us who have seen some of the world. If those who were looking purely for trade information have not taken the time to follow your journey, they might not have realized its value as a whole.

I am certain that those of us who live rather far away from the center of production welcome such contacts. I hope others will follow the example of the NEWS and send such emissaries as yourself, which brings closer together all those who are engaged in the industry.

Enclosed I am sending you a copy of today's *Palestine Post* which will be of interest to you, as you will observe that the serious disturbances which were going on while you are here grew worse and that the British Government was compelled to do what they should have done at the beginning—shown a firm hand, which would prevented the unnecessary loss of live and property.

With kindest personal regards.

MAX GREENBURG

Lindsay Forecasts Rapid Cleanup in Barcelona

The Crosley Radio Corp.
Foreign Department
Cincinnati, Ohio
Sept. 30, 1936.

Mr. George Taubeneck:

There is always a "scramble" here in the office to get hold of the latest copies of AIR CONDITIONING AND REFRIGERATION NEWS and to make things more convenient for the staff of this Export Department, I have arranged that a special subscription be placed for us.

Meanwhile, I wonder whether you could oblige me with a complete set of REFRIGERATION NEWS, back to the number which included your first "Round-The-World Travel Report."

Remember what I told you about the war in Spain, to be probably over by the middle or end of October? It does appear that this guess will become true and incidentally, it is my estimation that a subsequent clean-up of Barcelona will be much easier and more rapid than is at present anticipated.

You see, Barcelona cannot live without Spain and France does not want Catalonia because it is too highly industrialized and would seriously compete with its own industries if it became in any way affiliated with it. And it is a certain guess that a Fascist Government in Madrid would extend no favors of any sort whatever to Barcelona unless it came to terms. Catalonia will therefore be between two fires and this economic issue is bound to determine the solution.

A. G. LINDSAY,
Manager, Foreign Division.

Useful Reports on Foreign Countries

The Harry Alter Co.
1728 So. Michigan Ave., Chicago
National Distributors of Refrigeration Supplies for All Makes
Sept. 15, 1936.

Editor:

Under separate cover we are forwarding a copy of an analysis made by the United States Department of Commerce which you may keep for your files.

If this book is of any value to you, we will be pleased, as in a small measure it will partly reciprocate the very useful and interesting reports you have made on foreign countries in your trip around the world.

ALEX PORT, Export, Mgr.

HAP Looks Overseas

General Electric Supply Corp.
407 Warner Bldg., Nashville, Tenn.

I should like to renew my subscription to the ELECTRIC REFRIGERATION NEWS, and make it retroactive to take in all of the articles by George F. Taubeneck from his trip abroad.

H. A. PENDERGRAPH, Dist. Mgr.

TVA Pressure on Utilities Is Hurting Local Dealers

Gambill Distributing Co.
117-119 Ninth Ave., North
Nashville, Tenn.
Oct. 1, 1936.

Editor:

Thank you for your recent letter and we note that you have published our communication of the 14th, in your issue of Sept. 23.

The heading which you have placed on the article is somewhat misleading . . . "TVA Has Put Local Dealers Out of Business" . . .

The TVA has not actually put the dealers out of business. Their advertising and promotional work has helped the electrical industry. The fact that the independent power company is under pressure to build up their merchandising load is the thing that is playing havoc with the business.

The power company states their side of the case by the fact that the Federal Government is putting pressure on them for constantly lower rates, through the TVA activity. They in turn insist that they must get the merchandise on their lines to build up the current load quickly and without regard to the possible profit in the sale of the merchandise itself.

We believe our previous letter explained the situation—but inasmuch as your heading to same was somewhat misleading we thought best to write you again.

WHELESS GAMBILL, JR.

Errors Claimed in Report On Air Conditioning

H. C. Lambert
31 Elm St., Springfield, Mass.
Oct. 1, 1936.

Editor:

In your last issue, you listed air-conditioning plants in various cities, and under Springfield, Mass., you have listed Jensen's Candy Store and Restaurant as having a Carrier machine. This is not so. The machine is a Frick, installed by Hartford Automatic Refrigerating Co. and the only thing related to Carrier in the whole plant is a unit cooler.

You also list Jackson's, Inc., as having an air-conditioning plant installed by Carrier. This also is not true, as there is no air-conditioning plant at Jackson's.

This information is authentic, as we service both these plants and our books are open for inspection to prove same.

HAROLD C. LAMBERT.

Advertising Man Likes Interesting Specials

M. Glen Miller
8 South Michigan Ave.
Chicago, Ill.

Editor:

I want to congratulate all of you on your unusual ability to put out special numbers that are genuinely interesting and not merely magnets for a little extra advertising. Your Tenth Anniversary Number was as good as anything of its kind I have ever seen.

DONALD J. POWERS.

Glad to See You Back

Northern States Power Co.
1002 No. Fourth St.
Montevideo, Minn.

Editor:

Please renew my subscription to the ELECTRIC REFRIGERATION NEWS.

I have been without it for about one year now, and have missed it considerably.

Am enclosing $3.00 for my year's subscription.

GEORGE C. BEARDSLEY.

Pioneer Advertiser

H. R. Van Deventer
342 Madison Ave.
New York City

Editor:

As one of your pioneer advertisers, I want to congratulate you on the September 9, 1936, issue of the NEWS. The growth as well as the editorial excellence of the paper keeps pace with the refrigeration industry

H. R. VAN DEVENTER

Enclosed you will find a money order for $6.50 for a years subscription to ELECTRIC REFRIGERATION NEWS and the MASTER SERVICE MANUAL and the Refrigeration Engineer's Manual.

Please continue my subscription from the time when my last years subscription ran out.

I enjoy your paper very much and I don't want to miss any of the issues.

Also I would like to be entered on your mailing list. I am working as a serviceman and installation work on commercial refrigeration.—Harry J. Roberts, 3250 Frankford Ave., Philadelphia, Pa.

I am a reader of the ELECTRIC REFRIGERATION NEWS and would like you to place my name on your catalog mailing list. This is a worth while service, and I shall deeply appreciate it.—Joseph De Ganni, 111 Madison St., Hoboken, N. J.

Development of Freon Refrigerants Resulted from Union of Resources Of General Motors and DuPont

In the fall of 1930 the General Motors Corp. and the DuPont Co. joined hands, forming a subsidiary organization which was called Kinetic Chemicals, Inc.

E. G. Robinson, the general manager of the Organic Chemicals Department of the DuPont Co., was elected president; C. D. Porch, production manager of the same department, and Thomas Midgley of General Motors, were made vice-presidents. W. W. Rhodes, sales manager of Miscellaneous Chemicals, was appointed sales director, and R. J. Thompson of General Motors, engineer of the new company.

In 1931 a small plant was erected to prove the process which had been selected for the manufacture of the refrigerants and the name of "Freon" was registered in the United States Patent Office to cover the whole group of refrigerants.

The company has since registered the names of the various "Freon" refrigerants with their numbers as well as the "F" numbers which were first used to designate the laboratory products.

Through negotiations of W. W. Rhodes with an informal committee composed of George W. Mason of the Kelvinator Corp., Louis Ruthenberg, then president of Copeland, Inc., and the late "Geoff" M. Johnston, president of Universal Cooler, Inc., satisfactory contracts were made with refrigerating machinery manufacturers and use of the refrigerant soon developed.

It was at this time that the air conditioning industry commenced to show signs of being a growing industry and it may be said that the entrance of many manufacturers into this field dated from the advent of the "Freon" group of refrigerants.

Frigidaire was the first to make an extensive use of "Freon-12" in household refrigerators and small commercial and air-conditioning equipment.

York Ice Machinery Corp. took up the refrigerant for large tonnage refrigerating machinery which was soon to be followed by a complete line of the smaller sizes.

This company determined to build efficient "Freon-12" refrigerating machinery and spent large sums of money in their expermiental laboratories developing the design factors for "Freon-12" machines. They have since been very generous in publishing these design factors for the benefit of their competitors and the industry throughout the world.

Daniel Willard, president of the Baltimore & Ohio Railroad, believing that "Freon-12" was the ideal refrigerant for the air conditioning of his trains, equipped all of his new trains with "Freon-12" refrigerating machinery.

The Columbian Limited from New York to Washington which previously had been air conditioned with a different type equipment, was dismantled and re-equipped with "Freon-12" apparatus.

The Pullman Standard Car Mfg. Co., just then getting into the air conditioning of railway cars, determined on the exclusive use of "Freon-12," and as a result over 99% of all the mechanically air conditioned railroad cars in the United States are air conditioned with "Freon-12" machinery, according to Kinetic Chemicals.

An impetus was given to the business by a change in the specifications of the Navy Department to permit "Freon-12" equipment to be used on all classes of naval craft. It has since been extensively employed in the Navy on submarine boats and other ships.

The Carrier Corp. had been using another refrigerant in their centrifugal machines, but undertook the adaptation of "Freon-11" to their equipment. This member of the "Freon" group is now extensively used by the Carrier Corp. in their centrifugal machines.

At the 1936 summer meeting of the American Society of Heating and Ventilating Engineers, Willis H. Carrier, the pioneer in air conditioning in the United States, covered the subject of refrigerating media in an understanding and comprehensive manner.

Because of the importance of Mr. Carrier's utterances, part of his remarks on this subject of the "Freon" group of refrigerants was quoted from *Heating, Piping, and Air Conditioning,* are presented herewith:

"The next and possibly greatest stride was the development by Thomas Midgley, Jr., of a new series of refrigerants which were particularly adaptable to the reciprocating type of refrigeration machine. The best known of these refrigerants is dichlorodifluoromethane (CCl_2F_2).

"This resulted in a safe refrigerant for use not only in large machines but more particularly in a new range of reciprocating machines of smaller capacities, where there was a gap which previously had been entirely unfilled. This refrigerant was made available to the public in 1931.

"Not only did this refrigerant make application of reciprocating refrigerating machines to air conditioning safe, but in the smaller size machines it permitted a production and installation cost of practically half of that of ammonia machines of similar capacity.

"It allowed also the use of non-ferrous metals of only moderate strength in coolers and condensers. It enabled the use of direct expansion coils of the extended surface type directly in the air stream."

Grand Rapids Brass Began Manufacturing Refrigerator Hardware and Trim in 1884

Founded by Daniel W. Tower, a wood-carver who had a flair for designing metal furniture trim, the present Grand Rapids Brass Co. began business in 1882 as the firm of Farmer and Tower, manufacturers of metal trim products.

Formerly employed in a Grand Rapids furniture factory, Daniel Tower recognized the possibilities of a concern catering to the hardware and furniture trim industry. Leaving his position with the furniture concern he pooled his resources with those of Thomas Farmer, Jr., who operated a small foundry, and established the firm of Farmer and Tower.

By 1888 the business had increased to such an extent that it was reorganized and incorporated as the Grand Rapids Brass Co. with Daniel W. Tower as president. Mr. Tower retained this position until 1919.

In 1884, previous to this reorganization, the Grand Rapids Brass Co. (Then Farmer & Tower) began to make refrigerator trim. Tower not only designed this product, but also worked out most of the mechanisms connected with its manufacture.

Most of the early work was done exclusively for various customers, among whom were some of the largest manufacturers of that time.

A stock line was developed in the early nineties, however, and as early as Feb. 5, 1895 Mr. Tower had a patent on a foot-operated "unlocking and opening device" whereby, according to an old catalog the lady of the house could "avoid the necessity of setting down the contents of one hand in order to open the door of the refrigerator," thereby "saving steps, labor, and annoyance."

Many of these early patterns showed the influence of Mr. Tower's training in wood carving, and many an ice chest was trimmed as sumptuously as the furniture in the front parlor.

On Sept. 25, 1900, Mr. Tower secured patent rights on a steel-reinforced, sheet brass lock, strike, and hinge. This according to C. G. Bjorncrantz, present designer of Grand Rapids Brass Co., probably was the first of its kind in the refrigerator trimming industry.

Following Mr. Tower's resignation in 1919 there was a period of inactivity. About 1923 Elmer Osbeck and James L. Murray began to revise and revive the company. With their efforts Grand Rapids Brass Co. once more rose to a place of prominence in the refrigerator supply field.

In 1925 Gordon Roedding, who has doing creative development work for 30 years, came to Grand Rapids Brass Co., and has since designed and worked out the mechanics of all refrigerator trimming developments.

Rubber Ice Cube Tray Idea Born on Duck Hunt

Few if any of the six million American housewives whose electric refrigerators are equipped with "Flexo Trays" for the convenient removal of ice cubes realize that these handy rubber devices are the result of an idea developed on a duck hunt.

According to the Inland Mfg. Co., Dayton, Ohio, manufacturers of rubber cube trays and grids, Lloyd G. Copeman conceived the idea of using rubber as tray material while hunting ducks on a cold fall morning.

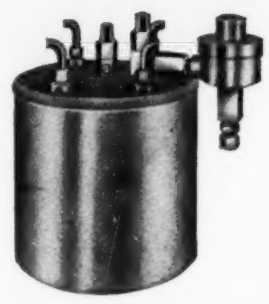
As he stood in icy water, he not only noticed that while the ice as it formed adhered firmly to his rubber wading boots, but also that when the boots were flexed the ice broke away from them.

He immediately recognized the possibility of freezing water in a rubber container and removing the resultant ice by flexing the container.

There followed a series of investigations and experiments from which the new convenience was developed. The manufacture of Flexo Trays, as they were named, was commenced on a small scale in 1929.

In the next two years specially designed rubber trays were being made for the leading makes of domestic refrigerators, and a short time later 90% of all the mechanical refrigerators produced in the United States were equipped with flexible rubber trays and grids, according to the company. The Inland Co. has made more than 2,000,000 Flexo Trays through August of this year, bringing the total number of refrigerators so equipped well over six million.

The Harvest Is Waiting



The figures for fiscal year ending June 30, 1936 recently released, show a substantial increase in beer consumption over 1935.

Dispensers to whom you sold Temprite a year ago are soundly established and in a position to profit from this steadily increasing consumption but—they need additional equipment—particularly additional Beer Coolers.

Summer is over and the business done by the lake resorts has moved back to the cities. This adds considerable volume to urban business and dispensers require additional facilities to take care of it.

All of this means that there is lots of beer cooling business waiting to be closed. And the easiest cooler to sell today is Temprite.

TEMPRITE 90° 40° INSTANTANEOUS

Get your share of this Temprite demand. Go after those dispensers now.

TEMPRITE PRODUCTS CORPORATION
1349 EAST MILWAUKEE AVE. - DETROIT, MICHIGAN
ORIGINATORS OF INSTANTANEOUS LIQUID COOLING DEVICES

The people's choice—
FOR THE TRULY MODERN REFRIGERATOR

"The people's Voice made me their choice,
And here's the reason why,
From Rubber Tray without delay
I pop out big and dry."

The people who buy mechanical refrigerators have cast a record vote for ice cubes instantly—at the refrigerator . . . from Flexible Rubber Trays or Grids.

The majority is 99 to 1 in favor of this modern method of getting ice cubes, as shown by a recent survey of refrigerator purchasers.

Inland full-page advertising in leading magazines accurately reflects the voice of the people who buy refrigerators. And these people measure the convenience-value of a mechanical refrigerator by the NUMBER of Flexible Rubber Trays or Grids which it includes as standard equipment.

Don't take chances. Insist that the refrigerator you sell comes factory equipped with—the people's choice for the truly modern refrigerator—a Flexible Rubber Tray or Grid in every ice compartment.

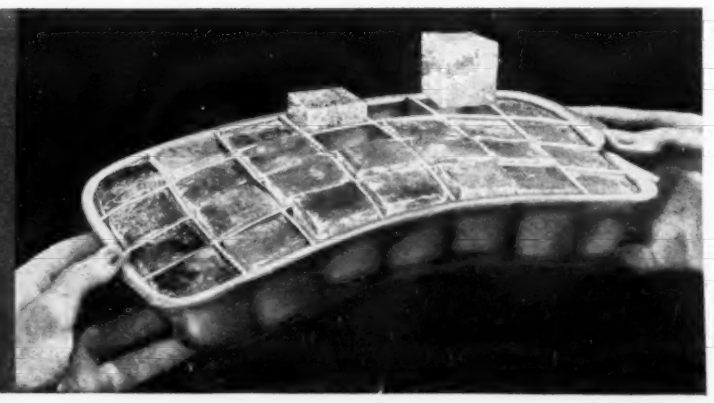
THE INLAND MANUFACTURING COMPANY • DAYTON • OHIO

Workable!

Factory production men and refrigeration dealers prefer Wolverine Seamless Copper Refrigeration Tubing because it is uniformly workable. Easy to cut. Easy to flare. Easy to bend. Saves time, fussing and cussing. Sealed bright and dry with the famous Wolverine Solder Seal. Made of 99.9% pure copper by the manufacturers of "Tubing Exclusively". Your jobber has it.

WOLVERINE TUBE CO.
SEAMLESS COPPER TUBE — BRASS & ALUMINUM
1411 CENTRAL AVE. DETROIT, MICH.

A TRULY MODERN REFRIGERATOR SHOULD HAVE A
FLEXIBLE RUBBER TRAY OR GRID
IN EVERY ICE COMPARTMENT



Nizer's Rapid Growth Prelude To Steady Market for Ice Cream Cabinet Manufacturers

By W. G. von Meyer, Vice President, Copeland Refrigeration Corp.

MENTION of ice cream cabinets probably doesn't suggest anything unusual to many men in the refrigeration industry, but back of this product is a story that is appropriate to the Pioneer issue. Ice cream cabinets were the first commercial application of small refrigerating units and unquestionably this development hastened the growth of commercial unit business in general.

The earliest units in the commercial field for other uses were of the same design as those used in ice cream cabinets.

How and why did ice cream refrigeration take the lead? Several factors are responsible, principal one being the genius of one man—the late Glen P. Cowan—who was most closely connected with the business, from its conception through its rise in a few short years to a spectacular business success.

Distribution Costs High

As general manager of Arctic Ice Cream Co. in Detroit about 1920, Mr. Cowan had occasion to notice the cost of distributing ice cream which had to be kept, enroute and on the dealers' premises, with ice and salt.

Often the same can was "packed" days in succession. The weight of ice and salt carried on the trucks was all out of proportion to the ice cream, not infrequently being 10 times as great. A good portion of the ice went for soft drinks and other purposes not benefiting the ice cream manufacturer.

Mr. Cowan wanted to eliminate this free ice evil. Furthermore, he wished to make the handling of ice cream more sanitary and less troublesome to his dealers.

Thus it was not a difficult thing to sell Mr. Cowan on the idea of a mechanically refrigerated ice cream cabinet—if such a thing could be worked out, and manufactured at a price which would be low enough to permit its use in stores doing an average business.

At that time Frigidaire household electric refrigerators were beginning to appear on the market, the factory being in Detroit. Chief engineer for Frigidaire was John R. Replogle, and the factory manager Frank L. Wurl.

Both of these men had gone to Frigidaire from General Motors Research Laboratories (with which the writer also was then associated) and there they had worked with a household refrigerator brought in under the name Guardian, and later renamed Frigidaire. So Messrs. Replogle and Wurl were among the few well-informed engineers in the new art of small unit refrigeration.

Cowan and Wurl Associated

Glen Cowan and Frank Wurl, with business interests widely separated as indicated, were University of Wisconsin alumni and this factor probably brought them together in Detroit. They discussed the electric ice cream cabinet with John Replogle. The idea had so much appeal that all three men were soon working together—a triumvirate that made refrigeration history.

Connected with Arctic Ice Cream Co. was a company known as Nizer Laboratories Co., engaged in various research activities. (The name "Nizer" was originated by the same man who thought up the name "Mazda" for electric light bulbs. He created his names on the general theory that they shouldn't have more than two syllables or five letters, and should have the letter "z" in the middle to give them zip and zest.)

Development Starts in 1921

Development of the ice cream cabinet was begun in this division about 1921, with Arctic dealers in Detroit providing an ideal proving ground for the first cabinets built.

In principle the first cabinets were identical with later ones, but had wood exteriors. Inside was a cork-insulated copper tank with alcohol and water brine surrounding cylindrical upright sleeves which accommodated ice cream cans.

The unit was water-cooled and built in at one end. It employed a single-cylinder compressor which had a 2-inch bore and 4¼-inch stroke, and ran at 175 r.p.m.

So successful were the results from the very outset that after slightly more than one year of trial, the product was placed in production in an initial program to equip all worthwhile ice cream customers of the Arctic company.

Corporation Formed

Nizer Corp. was formed; its first factory was over the garage of the ice cream company plant on Gibson St. in Detroit. Two production cabinets were built in April, 1923, and the output that year reached a peak of 302 in October, and totaled 1,470.

Naturally, the installation of electric cabinets in dealers' stores created much interest in the trade, locally and outside. Arctic ice cream salesmen found that they had a great device for getting competitors' customers, and many of the first cabinets were used for this purpose—to the great dismay of the other dairies.

Who wouldn't take one of these good-looking, labor-saving cabinets—even if they did have to pay the current and water bill and not get any free ice? The ice cream salesman presented a logical argument of how the saving in shrinkage by holding constant temperature would, in fact, increase profits.

Detroit Creamery Capitulates

Arctic's bigger competitor, Detroit Creamery Co., thought the solution to its dilemma would be the conversion of soda fountains, using small ammonia machines. This proved an expensive, impractical venture, however.

Detroit Creamery soon made a deal with Nizer, placing a firm order for 100 cabinets a month for 12 months. These were followed by several thousand more electric cabinets but not Nizers—which was no reflection on the product.

Ice cream manufacturers in other cities were by this time becoming aware of the Detroit innovation. In October 1932 at the Dairy Show in Cleveland they had opportunity to see Nizer cabinets on display. Much comment was made but, good as the idea might be, there was a feeling against it. To adopt electric ice cream cabinets would mean obsoleting ice cabinets and plant equipment, and making a tremendous new investment about which only Nizer Corp., and an affiliated ice cream company, had short-period data as to depreciation, upkeep, etc. Would electric ice cream cabinets go over nationally—and how soon?

Distributing Problems

Several marketing alternatives were available. The cabinets could be offered to all manufacturers and sales perhaps developed slowly—or some exclusive territories granted with bona-fide contracts for a given number of cabinets.

Mr. Cowan chose a combination course: a few exclusive territories and the others open, believing that the exclusive territories would start sales in the open ones.

To Telling-Belle-Vernon Co. of Cleveland were assigned 54 counties in Ohio and A. B. McLendon of Dallas and Waco, Tex., got practically the western half of the country. In addition there were one or two smaller dealers. Why shouldn't an ice cream manufacturer "risking" big sums in a new method of ice cream merchandising have some advantage? The plan worked out all right—but with an interesting effect that will be touched upon later.

Nizer Corp. got busier and busier, and found it necessary to expand plant facilities three times in 18 months. From the garage, they moved to the Commerce Motor plant on Mackie St. (now Melville), and within a year built an addition doubling factory space 100%. Universal Cooler now occupies the Melville St. property.

All of this production required capital for machinery, material, payrolls, etc. It was always available through Messrs. J. Robert Crouse and H. A. Tremaine of Cleveland, who controlled the company. Both were men of high ideals, J. Robert Crouse being most interested in Nizer and a great leader. He deserves great credit, with Cowan, Replogle, and Wurl, for the fine organization that had been built.

His meetings at Waldenwoods are known to many connected with the early refrigeration industry, and the Nizer Corp. camps there will ever be pleasantly recalled by those of us who were fortunate enough to attend.

Selected U. of M. Grads

One of Mr. Crouse's pet projects was to select 10 outstanding men from the graduating class of the University of Michigan and train them for executive work in his company. His method of selecting them was somewhat novel—he would ask the faculty to select the 50 most promising members of the graduating class, for which he gave a banquet. From his observations at the banquet, he would select the 10 men he wanted.

Most of the students thus selected didn't remain in the refrigeration business because advancement didn't "come fast enough." But two who did stick—John Wyllie, Temprite Products general manager; and Dean Seitz, Russ Mfg. Co. engineer—have made enviable reputations for themselves in the industry.

The Nizer enterprise prospered beyond anyone's fondest hopes—though there was no sales department during the first months. Ice cream manufacturers came from all over the country. No order was written for less than a carload (about $20,000), terms were sight draft attached to bill of lading, and no customer was considered unless he agreed to send a man to Detroit for service training (one week minimum or longer until passed). Where was there ever a business like that before?

Production to 8,394 in 1924

Production went to 8,394 cabinets in 1924 with a peak of 1,200 in June. There were three sizes, four, six, and eight-hole, all water-cooled, self-contained and selling at $360, $380, and $400 net to the ice cream manufacturer—quantities 50 or 500.

A few paragraphs back it was said that the exclusive territory plan had an interesting effect. What it did was to hasten competition's entry into the field. Ice cream manufacturers whose customers were being taken away by the electric cabinet weren't going to let this go on for too long. In self-protection, they literally placed orders for any quantity needed to justify production in the lap of a manufacturer they thought qualified. Consequently other makes soon appeared, with Frigidaire first.

So vital to the ice cream manufacturer did these new cabinets become that all sorts of strategy were resorted to in an effort to get the cabinets into the territory first—and thus to save or gain retailers. Men were hired to bribe freight agents and ride the cars carrying the cabinets from the factories to see that they came through in the fastest possible time.

But Nizer had begun preparation for aggressive selling. Mr. Cowan had appointed J. L. Valerius, who had many years of contact in the dairy and ice cream industry, as sales manager. Your narrator, drafted from the Nizer engineering department, worked with him in dealing with customers who called at Detroit.

There were still hundreds of ice cream men who wanted to see these cabinets perform and so the routine of a day included a tour of stores after a trip through the factory.

At one stop, never missed, the visitors thrilled at tasting strawberry ice cream which was purposely not sold and already had been in the same cans even months at the last visit, and still good as new—with the old ice-and-salt method, ice cream wouldn't keep two weeks.

At noon or in the evening—or both—we took time out at Johnny's on Fort Street where our guests marveled at and enjoyed the open serving of "boiler makers" and "helpers" during prohibition times.

At the end of 1925, the sales organization was well developed with branches in key cities.

In the branch sales organization were men who are still prominent in the industry. Many of them, working on a commission basis, made a much greater income (some said to have gone into six figures) than the highest-paid officials in the company.

Among those who worked in the field sales organization and who are still active in the industry are: E. R. Legg, Kelvinator national direct sales manager; J. M. May, R. J. Scheu, A. P. Hawkins, R. N. Palm, H. B. Johnson, A. J. Lutz, and J. P. Dietz, all with Kelvinator; J. J. Ernst and F. H. Marx, with Anheuser-Busch; A. N. Delzeith of Norge; C. E. Terry of Temprite Products; and George Monjian, refrigeration parts distributor in Chicago.

Others in the factory staff who are with Kelvinator today included E. R. Kelley, P. D. Parker, Al Knapp, and R. M. Martin.

Sales in 1925 were 50% over 1924 at 12,463, with peak sales of 1,600 cabinets during each of the months of May and June. Air-cooled units had been introduced and were 20% of sales. Remote style cabinets accounted for about one-third of the total.

14,405 Sales in 1926

In 1926 sales totaled 14,405 cabinets. The proportion of water to air-cooled reversed, with 75% now air-cooled and the remote also 75%. The company was still a big money-maker, annual sales being close to $6,000,000.

Several changes had occurred just prior to this time in the Nizer structure. Stock had been sold and New York bankers took over the management, sending Glen Cowan on a trip to Europe. He never came back into the company actively. A number of administrations headed successively by Otis Glazebrook, C. V. Carpenter, and A. W. Berresford culminated in the merger of Nizer with Kelvinator and Leonard as Electric Refrigerator Corp. Nizer went in as a very healthy member—at least as far as financial position was concerned, with a surplus of several millions.

Identity Retained

With Kelvinator, Nizer continued its separate identity for a number of years, doing a very creditable business under Harry A. Sieck as sales manager. Mr. Sieck is responsible also for the success of the portable two and three-hole cabinets which constituted such major part of the volume after 1928. These low-priced cabinets opened a virgin field among the ice cream retailers previously considered too small to warrant electric cabinets.

While associated with Kelvinator as statistician after several years field experience, the writer compiled various figures that revealed the extent of the ice cream cabinet market.

In July 1927 there were 340,000 ice cream retailers, and up to that time there had been installed 43,000 Nizer cabinets and 59,400 others.

It was estimated at the time that the remaining market was 100,000 cabinets, eliminating small stops, many of which it has since been made possible to equip by introduction of the "portables."

There has been a general movement, too, toward specialized dairy stores which require more and larger cabinets. Some such stores have a dozen big cabinets each. And then there is the big market for replacements which began several years ago.

Little wonder that the ice cream cabinet business continues so strong year after year and that, with a larger number of manufacturers, all are enjoying good sales.

Sales Pioneer

W. G. VON MEYER

W. G. von Meyer, vice president of Copeland Refrigeration Corp., and formerly assistant sales manager of Nizer Corp., is the narrator of this story on the development of the ice cream cabinet business. Mr. von Meyer's history in refrigeration dates back just about 20 years, when he was working in the Remy laboratories at the time that John R. Replogle and Frank Wurl were making tests on the original Frigidaire unit. In 1923 he joined these two men at Nizer Corp. His work there in the sales department and as statistician makes him one of the best-fitted men in the industry to write the early history of the ice cream cabinet phase of the business. After leaving Nizer Mr. von Meyer was head of the Valerius Soda Fountain Co., and then joined Copeland in 1933.

At One of the Nizer Camps

J. Robert Crouse (seated in left foreground behind the small boy) delighted in taking executives and customers to the Waldenwoods estate. Some industry veterans in this group are Ed May and Lynn Hosier of Mayson Mfg. Co.; Bill Devlin of Universal Cooler; Ross Robinson of Kelvinator; L. M. Young, Detroit refrigeration parts distributor; John R. Replogle, refrigeration engineer; and the late Lou Chamberlain, of the Michigan Alkali Co. Can you recognize any other oldtimers?

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Petrie, Leonard Sales Manager, Began As Chicago District Superintendent For Kelvinator in 1925

After almost 12 years of close contact with the sales development of the electric refrigeration industry, R. I. Petrie, sales manager of the Leonard Refrigerator Co., Detroit, retains his pioneering spirit and the urge to find new field to conquer, according to his associates at Leonard.

Mr. Petrie entered the electrical refrigeration field in February, 1925, when he became associated with the sales division of Kelvinator Corp., and was soon appointed Chicago district manager.

At that time, electric refrigeration was on the brink of the beginning of its greatest expansion period. Little advertising was done, and Mr. Petrie, as sales manager of a large urban district, was called upon to train his men in the selling of the idea of electric refrigeration as well as the particular product they were offering to the consumer.

The pioneers of those days, as Petrie recalls, plunged into the fray with might and main. They worked out their own sales campaigns, developed their own sales technique, mapped out their own routes, and "dug up" their own prospects.

When Petrie joined the Kelvinator organization, Chicago was a big ice-using city. The iceman trudged up and down the rear entrances to its cliff-like abodes of apartment dwellers. Ice wagons mingled with bakers' wagons and creamery carts in the back alleys. The iceman was busy making deliveries at the back doors, while electric refrigeration salesmen talked electric refrigeration at the front doors.

As Chicago district manager, Petrie had a big field—a virgin field. So did the four other Kelvinator district managers, for Kelvinator then had only five men in the field covering the entire United States. There was a man in the New York area. Two more traveled through the South. A fifth man traveled up and down the Pacific Coast. This quintet was all that Kelvinator had to spread the sales story of Kelvinator electric refrigeration.

Their business at that time was puny as compared with what it is today. Petrie recalls that in 1924, the year before he joined Kelvinator, the total domestic sales in the seven states he was assigned to was only 668 units.

But so rapidly did the industry develop, so quickly did the public grasp the significance of this new development, that the following year the sales in the same area had jumped to 2,500 units. From then on it would have kept a man busy with a slide rule to figure out the percentages of increase.

"Those figures of the early days really are amusing now," said Petrie, reminiscing on the pioneer period of the industry. "We thought 2,500 units was a big volume, but we little realized that ten years later a single dealer would dispose of more than that number of units."

In this year, 1925, occurred an event that was destined to provide the impetus that projected electric refrigeration into the front ranks of industry. This was the prodution of a self-contained unit. Up to that time, the manufacturer of electric refrigeration merely produced the mechanical equipment, which was installed in a cabinet by the distributor or dealer.

Being a distributor or operating a factory branch in those early days meant little of what it does today, Petrie recalls. As manager of the Washington, D. C. branch for Kelvinator, he found that this really was a dealer operation.

"It was really amusing," he said, "in comparing operations in those days with what is customary today. There were few dealers under a distributor or branch and the distributor distributed little except to himself. Twelve salesmen constituted the selling force to convert the nation's capital to the benefits of electric refrigeration. The field was great, but the workers few."

With increasing sales national sales plans began to be formulated. Advertising was discussed—but used sparingly.

Petrie recalls that while he was a member of the sales staff in the home office. his men used to sit around the table and gaze longingly at the attractive ads the automotive companies were using in the *Saturday Evening Post* and other national periodicals.

"Oh, for enough money to do some of that advertising," they sighed.

As the industry grew, it became apparent that some form of financing the sales of electric refrigeration must be worked out.

Petrie was instrumental in the pioneering of this line of attack, too, for he was the first sales manager of Redisco, the finance company that finances millions of dollars worth of sales for Kelvinator and Leonard today.

The average housewife wanted to buy "on time." Dealers had to find ways to finance sales for their customers, through outside finance companies or through bank paper.

Redisco fitted into the refrigeration picture. It financed sales to distributors and to dealers, and it financed sales to the ultimate consumer. It arranged for "floor planning" so that a dealer might have a larger number of models on display in his showroom.

With Redisco soundly established, the growth of Kelvinator sales accelerated still more. Dealers could arrange financing on a definite basis. More and more branches and distributorships were set up. Public acceptance grew.

As branch manager in Cleveland, Petrie saw the business grow there from a small beginning until the name of Kelvinator became well known throughout the district.

At that time the big East Cleveland and Shaker Heights project of the Van Sweringens was at its height, providing a virgin field for installation of refrigeration in new homes. Apartment houses were springing up almost over night, and in the apartment house field Kelvinator was making a favorable impression.

With business expansion, the need of a bigger field force became apparent. Regional managers were assigned and new dealers were signed up until national distribution was accomplished.

Petrie became regional manager of the territory east of the Rockies. That meant traveling by night and working by day, instructing new dealers how to sell, buoying up the flagging spirits of dealers who found themselves in the doldrums with a new product on their hands and little knowledge of how to sell it.

In those days, as Petrie tells the story, it was no uncommon thing for a regional manager to get into a city, go out into the territory with a retail salesman, and show him how to close a deal.

"It was up to the regional man in those days not only to get new dealers, but to show them how to sell, help them with a service set-up and even show them how to keep their books," he says. "In fact, he had to be a sort of Jack-Of-All-Trades."

Realizing the importance of being able to manufacture its own cabinets, Kelvinator bought the big plant at Grand Rapids that now houses Leonard operations, and bought out the Leonard Refrigeration Co.

Here again was a pioneering job to be done, although by this time public acceptance was established. But a name new to the electric refrigeration industry to be merchandised, a new sales set-up was to be arranged and new policies were to be established.

Petrie became first sales manager of this organization. Two years on this job found a distributor-dealer organization built up and the Leonard refrigerator known from coast to coast.

For two years, Petrie was domestic sales manager of Kelvinator, and then in 1935 was called back to his old job as sales manager of Leonard, a post that he occupies today. Here on this job, he is happy. He still has the spirit of a pioneer. He likes to get out into the field and talk to the men who are on the firing lines selling Leonard.

Van Deventer Has Been Patent Specialist For 25 Years

With a record of 25 years as a patent attorney, H. R. Van Deventer, of New York City, has specialized in the refrigeration field over most of that period, and has been connected with the development of several noteworthy patents in the industry.

During Frigidaire's patent suit against the General Necessities Corp., of Detroit, in March, 1927, in which the basic patents on air cooled condensers for electric refrigeration units were involved, Mr. Van Deventer appeared as expert for the defendant company.

He is a member of the A.S.R.E. the Electrical Engineers, the Automotive Engineers, and several other engineering societies, and has been a consistent contributor to the technical press. He is the author of a book entitled *Law Charts and Patent Engineering,* and several other volumes of a technical character.

Mr. Van Deventer was among the first patent attorneys to advertise in AIR CONDITIONING AND REFRIGERATION NEWS, then ELECTRIC REFRIGERATION NEWS, and has continued to advertise over a 10-year period.

He is at present a practicing patent attorney in New York City, with offices at 342 Madison Ave.

Carraway Long Active In Air Conditioning In Southwest

Thomas W. Carraway, president, general manager, treasurer, and chief engineer of the Carraway Engineering Co., Inc., Dallas, Tex., has long been active in the air-conditioning industry, principally in the southwest.

For a short while after leaving college he was with a large mining company in South America and Mexico, resigning his position there to enlist in the U. S. Army.

While in the army he installed two large power plants, one at Camp Holabird, Baltimore, and the other at Camp Normoyle, San Antonio, Tex.

After resigning his commission, Carraway decided to take up the business of air conditioning for a livelihood. He worked on the development of the first Beloit cooler in the Union Stock Yards, Chicago.

Carraway's latest venture in the air-conditioning field is his present company in Dallas.

Carraway is, primarily, an electrical engineer, being a member of the American Institute of Electrical Engineers, the American Association for the Advancement of Science.

He is the patentee of several inventions, among them an automatic packless valve, a defroster, a heat exchanger, and others.

Lipman Developed Majestic Rotary Unit, Headed Own Commercial Machine Company Between 1906-1924

C. E. L. Lipman, consulting engineer residing in Chicago, and whose name is now widely known as the trade name of a line of commercial units, began his activities in the refrigeration industry in 1912, when he commenced development work on refrigeration compressors.

At the time, he was head of the Lipman Mfg. Co., having begun the manufacture of pumps in a small shop in Beloit, Wis., in 1902. The business was incorporated as the Lipman Mfg. Co. in 1906.

In 1917 Lipman incorporated the Lipman Refrigerating Car and Mfg. Co. and built a factory in South Beloit, Ill. Production of railroad refrigerator car equipment was begun, and the first insulated refrigerator transport trailer was built, this later becoming the property of Morris & Co., meat packers.

Early in 1918 Lipman designed and put into production self-contained, fully automatic, commercial refrigerating machines of 1½-ton capacity.

Lipman was among the first to install commercial refrigerating units, fully automatic, with the elimination of brine tanks.

In 1919 he put into production a line of 4-cylinder, fully-automatic, self-contained refrigerating units of 2-ton capacity.

Lipman turned to the household refrigeration field in 1921 when he designed and manufactured units that did not use brine tanks. The evaporators of these refrigerators consisted of cast iron chambers for ice trays. The casting was surrounded by a steel coil, the entire unit being hot-dipped in zinc.

In 1922, Lipman designed and put into production his multiple V-belt drives which were first adapted to small refrigerating machines.

Lipman retired from active connection with the company at Beloit in 1924 and started development work on rotary, semi-rotary and hermetically sealed compressor units, establishing headquarters in Chicago.

In accordance with a deal made Jan. 2, 1930, between Lipman and the Grigsby-Grunow Co. of Chicago, the latter firm was licensed to manufacture the unit development by Lipman.

Lipman became consulting engineer for the Grigsby-Grunow Co. when they went into the household refrigerator business. However, since the dissolution of that company in 1934, Lipman has been engaged in work as a private consulting engineer.

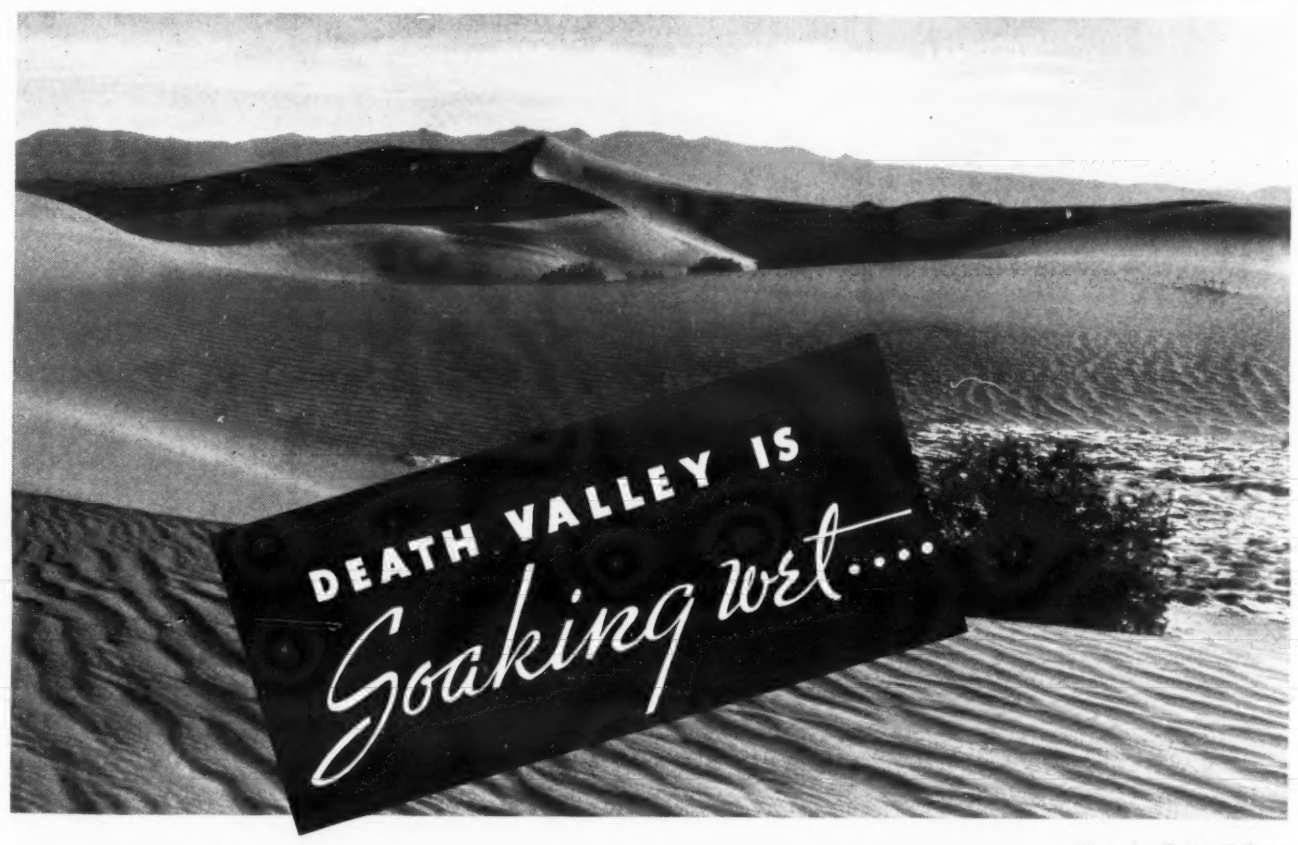

Photo by Ewing Galloway

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Fedders dehydration is just one of the hidden values that are engineered and built into Fedders products. It is one of the reasons why they have been proved and approved by the industry, by thousands of users, and by every test of time and field service in all parts of the world.

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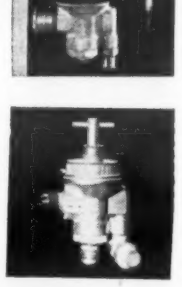
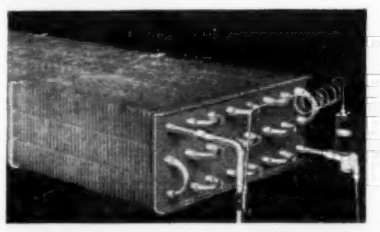
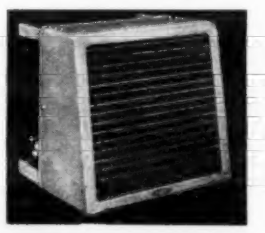


Fedders Manufacturing Co.
BUFFALO, N. Y.

Atlanta, Boston, Chicago, Cincinnati, Dallas, Los Angeles, New York, Philadelphia





One of several batteries of Fedders Dehydrating Ovens. Note Vacuum recording dial in foreground.

Gordon Muir, Author of Nizer Advertising Stunts Decade Ago, Now Directing Temprite Products Promotion

Gordon Muir, a pioneer in refrigeration advertising and sales promotion work, came into the refrigeration field like many another executive, from the automobile industry.

He had been at one time advertising and sales promotion director for Maxwell-Chalmers; and at the time he was called into the refrigeration business he was in advertising work for the Gray Motor Car Co., where he worked under Henry Burritt (now vice president of Kelvinator in charge of sales) who was general manager.

He received an offer from J. Robert Crouse, head of Nizer Corp., to be advertising and sales promotion manager. At about the same time Mr. Burritt joined the old Leonard Co. of Grand Rapids (later absorbed by Kelvinator).

The big bulk of Nizer's business was in ice cream cabinets, and most of Mr. Muir's efforts were designed towards "sewing up" the larger ice cream producing concerns, as practically all of the ice cream cabinet sales were on an exclusive-to-company contract basis.

Stunt for 1925 Dairy Show

The stunt which he planned and carried out at the Dairy Industries Exposition of 1926, held in Detroit was one of the first of the many sensational planned promotion stunts for which the refrigeration industry has become famous.

Nizer was running into some pretty stiff competition on ice cream cabinet business at that time, and the annual Dairy Show loomed as a principal battleground for the fight, because of the large number of ice cream manufacturers which it attracted.

Ice cream cabinet selling was still in a "pioneering" stage, that is, the salesmen still had to sell the idea of an electrically refrigerated cabinet as opposed to the old ice-and-salt method.

Produced Motion Pictures

But there were complications in selling against ice, because the electric refrigeration industry had a tacit agreement (as related many times in editorials in the NEWS) not to attack or disparage the ice industry with the written word.

However, there was nothing in the agreement which barred the use of *photography* in outlining the story of the advantages of electric refrigeration over ice, so Mr. Muir wrote and produced, through the facilities of the Metropolitan Motion Picture Co. of Detroit, a three-part movie entitled "The Ice That Failed or the Truck Man's Bride."

Nizer officials and employes constituted the cast of 60 who had parts in the movie, principal roles being assumed by Harry MacDonald, now a well-known dairy owner in Detroit; and Harry Sieck, manager of ice cream cabinet sales for Nizer. The theme of the picture was the progress made by the ice cream retailer after the Nizer cabinet was installed, and closed with a scene in which even the iceman was admiring the Nizer cabinet.

For a theater Mr. Muir rented the old Bonstelle Playhouse (now the Mayfair motion picture theater) in Detroit, which was very close to the convention hall where the Dairy Show was held.

To secure attendance at his show Mr. Muir sent out programs which were exchangeable for tickets at any of the hotels at which the visitors might be staying.

Large, specially built balloons telling about the movie were also floated over the convention hall, and Mr. Muir swears that competition, in the dark of night, shot several of them down. Despite this, the Nizer movie "stole the show" at the convention, and resulted in many orders, Mr. Muir declares.

Counteracting 'Noisy Nizer'

Mr. Muir was also kept busy writing promotion material that would counteract attacks on Nizer's vulnerable spot —its noisy operation. The alliterative term "Noizy Nizer" coined by competition, and their story of "every time you hear it, it's costing you money" made life pretty miserable for Nizer salesmen.

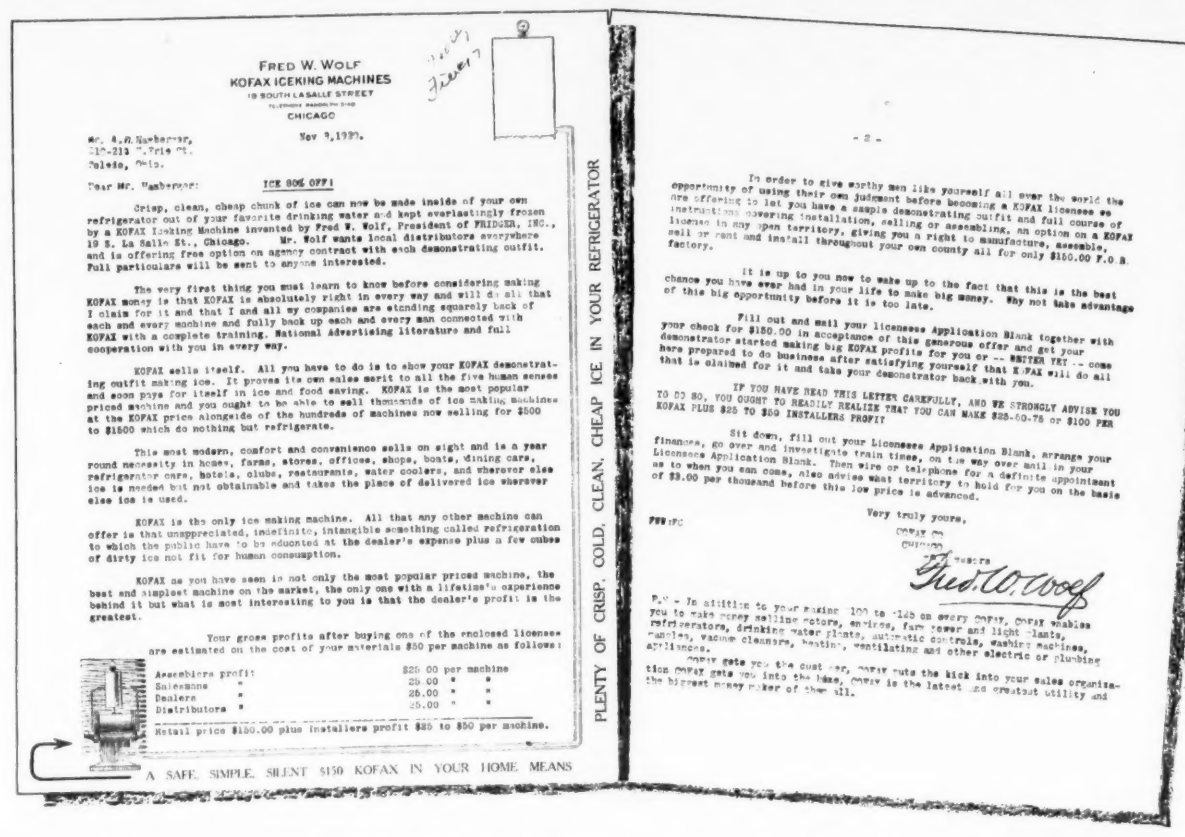
Mr. Muir remained with Nizer through the time of its merger with Kelvinator Corp. in 1927. He believes that the merger might not have been consummated had not the late Glen Cowan, who was in active charge of Nizer sales, been in Europe at the time and ignorant of happenings.

Remaining with the Nizer division of Kelvinator until 1928, Mr. Muir then left to enter advertising work, and was counsel to Norge Corp. for some time. He then went to California for a few years and returned to Detroit about 1933, joining the advertising staff of Universal Cooler.

He was later appointed director of advertising for Temprite Products Corp., and in this position he has done much of the same "pioneering" work for the electric refrigeration of beer that he did in his work with ice cream cabinets.

His latest Temprite catalog has been hailed throughout the brewing and beer dispensing fields as probably the most authoritative work yet published on the proper refrigeration of beer on the dispenser's premises.

Fred Wolf's 1920 Promotion Letter Visioned Large Profits



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Toledo, Ohio.

Dear Mr. Manheimer: **ICE 80% OFF!**

Crisp, clean, cheap chunk of ice can now be made inside of your own refrigerator out of your favorite drinking water and kept everlastingly frozen by a KOFAX Icaking Machine invented by Fred W. Wolf, President of FRIDGEX, INC., 19 S. La Salle St., Chicago. Mr. Wolf wants local distributors everywhere and is offering free option on agency contract with each demonstrating outfit. Full particulars will be sent to anyone interested.

The very first thing you must learn to know before considering making KOFAX money is that KOFAX is absolutely right in every way and will do all that I claim for it and that I and all my companies are standing squarely back of each and every machine and fully back up each and every man connected with KOFAX with a complete training, National Advertising literature and full cooperation with you in every way.

KOFAX sells itself. All you have to do is to show your KOFAX demonstrating outfit making ice. It proves its own sales merit to all the five human senses and soon pays for itself in ice and food saving. KOFAX is the most popular priced machine and you ought to be able to sell thousands of ice making machines at the KOFAX price alongside of the hundreds of machines now selling for $500 to $1500 which do nothing but refrigerate.

This most modern, comfort and convenience sells on sight and is a year round necessity in homes, farms, stores, offices, shops, boats, dining cars, refrigerator cars, hotels, clubs, restaurants, water coolers, and wherever else ice is needed but not obtainable and takes the place of delivered ice wherever else ice is used.

KOFAX is the only ice making machine. All that any other machine can offer is that unappreciated, indefinite, intangible something called refrigeration to which the public have to be educated at the dealer's expense plus a few cubes of dirty ice not fit for human consumption.

KOFAX as you have seen is not only the most popular priced machine, the best and simplest machine on the market, the only one with a lifetime's experience behind it but what is most interesting to you is that the dealer's profit is the greatest.

Your gross profits after buying one of the enclosed licenses are estimated on the cost of your materials $50 per machine as follows:

Assemblers profit	$25.00 per machine
Salesmans "	25.00 " "
Dealers "	25.00 " "
Distributors "	25.00 " "

Retail price $150.00 plus installers profit $25 to $50 per machine.

A SAFE, SIMPLE, SILENT $150 KOFAX IN YOUR HOME MEANS PLENTY OF CRISP, COLD, CLEAN, CHEAP ICE IN YOUR REFRIGERATOR

- 2 -

In order to give worthy men like yourself all over the world the opportunity of using their own judgment before becoming a KOFAX licensee we are offering to let you have a sample demonstrating outfit and full course of instructions covering installation, selling or assembling, an option on a KOFAX license in any open territory, giving you a right to manufacture, assemble, sell or rent and install throughout your own county all for only $150.00 F.O.B. factory.

It is up to you now to wake up to the fact that this is the best chance you have ever had in your life to make big money. Why not take advantage of this big opportunity before it is too late.

Fill out and mail your Licensees Application Blank together with your check for $150.00 in acceptance of this generous offer and get your demonstrator started making big KOFAX profits for you or -- WRITE YES -- come here prepared to do business after satisfying yourself that KOFAX will do all that is claimed for it and take your demonstrator back with you.

IF YOU HAVE READ THIS LETTER CAREFULLY, AND WE STRONGLY ADVISE YOU TO DO SO, YOU OUGHT TO READILY REALIZE THAT YOU CAN MAKE $25-50-75 or $100 PER KOFAX PLUS $25 TO $50 INSTALLERS PROFIT

Sit down, fill out your Licensees Application Blank, arrange your finances, go over and investigate train times, on the way over mail in your Licensees Application Blank. Then wire or telephone for a definite appointment as to when you can come, also advise what territory to hold for you on the basis of $3.00 per thousand before this low price is advanced.

Very truly yours,

COFAX CO
CHICAGO

Fred W. Wolf

P.S. - In addition to your making 100 to 1200 on every COFAX, COFAX enables you to make money selling motors, engines, farm power and light plants, refrigerators, drinking water plants, automatic controls, washing machines, appliances, vacuum cleaners, heating, ventilating and other electric or plumbing

COFAX gets you the dust out, COFAX puts the kick into your sales organization COFAX gets you into the game, COFAX is the latest and greatest utility and the biggest money maker of them all.

What would a contemporary electric refrigerator dealer give to make "$25-50-75 or $100" on each box he sells, "plus $25 to $50 installer's profit?"

He'd probably be willing to give his hat and shirt, and auction off his star salesman to competitors besides.

Yet this was the bona fide offer made by Fred Wolf to distributor prospects 16 years ago in a Kofax promotion letter photographically reproduced above.

In those days, when "ice by wire" was as startling to the average man as is the weekly trans-oceanic crossings of the zeppelin "Hindenburg" today, Wolf offered his freezing unit to distributors shipped in knocked-down form, thus giving them the opportunity to assemble, set up, and install it in a customer's ice-box—and realize profits on all operations.

Wolf urged his prospects to buy the machine materials from Kofax for $50 (paragraph seven), and realize $25 on assembling the installation and from $25 to $50 installing the unit itself. If the distributor was smart enough to handle the sales himself, so much the better—there was another $50 salesman's and dealer's profit in it for him.

A Jack-of-all-Trades could make a 200-300% profit on the Kofax unit. Even a "front office" distributor could make one of 100%.

Even restricted territories came at only $3 per 1,000 of population in those days—see the last paragraph of the letter before the signature.

Ah, yes—those were the days!

Kelvinator's 'Doc' Harlan, Nema Commercial Division Chairman, Traces Development Of Big Units During Last 10 Years

In recognition of his pioneer work in the refrigeration industry, J. A. "Doc" Harlan, sales manager of the commercial division of the Kelvinator Corp., Detroit, has been chosen chairman of the Commercial Refrigeration Section of the Refrigeration Division of Nema.

He is experienced in selling, purchasing, engineering, and manufacturing refrigerators.

Having been active in mechanical refrigeration since the earliest days of its inception, Mr. Harlan both knows and is known well in the field.

Traces Commercial Development

To him, commercial refrigeration is an interesting study in tracing its development over a span of years and in trying to vision what may be accomplished in the next decade.

"Commercial refrigeration," declares Harlan, "is really an outgrowth of the development of domestic refrigeration. The first installations were made by taking a condensing unit from a domestic refrigerator and hooking it up to a brine tank.

"We developed many weird cooling units in those days. We placed flues in brine tanks to increase the cooling surface. Then we got to putting fins on the refrigerating coils.

Build Brine Tanks to Fit

"When a dealer in those days obtained an order to install commercial refrigeration he would get a tin smith. Together . . . they would measure the size of the ice bunker, and between them they would develop a brine tank that would take all the refrigeration possible. In those days the cost of installation was half of the total cost.

"We used SO_2 largely, and the slightest presence of water in a pipe caused plenty of trouble. In order to prevent leaks in our brine tanks we employed anti-leak fluids similar to those we put in our car radiators today.

"The early type of refrigeration for meat markets was nothing more than the matter of installing cooling coils or a brine tank in the old ice bunker. We tried suspending from the ceiling of the box a brine tank in which a boiler was immersed. This installation was decidedly heavy, and most of the old boxes were not sufficiently strong. The weight of the unit sometimes would pull out the ceiling and crash to the floor.

"Apartment house refrigeration then began to assume formidable proportions. At this time apartment house installations were classified as 'commercial,' and there was a steadily increasing demand.

"It was not long before the market for commercial electric refrigeration opened up with a vengeance, and companies engaged in the industry began to set up separate departments to handle it.

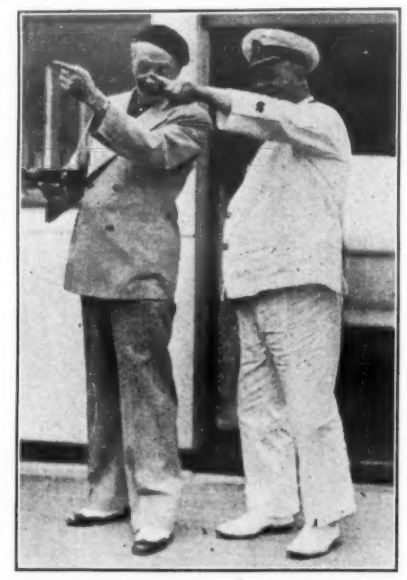
Worked with Refrigerator Makers

"We worked in cooperation with the manufacturers of commercial equipment — display cases, water coolers, bottle coolers. Eventually there emerged a complete line of commercial equipment.

"The manager of a commercial department today has a small army of divisions to direct.

"Latest of the developments to be tossed into the lap of many of the commercial departments for development is air conditioning, and that alone covers enough angles of applications to make it a department of its own. It's a field that has only been tapped. It will grow to such an extent that the present will seem like pioneering days 10 years from now."

Sales Pilot



J. A. "Doc" Harlan (left) has pioneered many types of sales movements in the electric refrigeration industry and in the accompanying article he relates some of the progress of the commercial refrigeration field. Harlan was re-elected chairman of the Commercial Refrigeration Section of the Refrigeration Division of Nema Tuesday.

Kylberg's 12-Year Career Started With Servel

One of the early refrigeration merchandisers was V. C. Kylberg, now a contracting maintenance engineer in Maplewood, N. J.

Mr. Kylberg joined the industry in 1925, just before the boom which was to make it the great new industry of the decade. He had gained much experience as plant facilities expert, and, later, sales executive for the government's war industries, finishing this work in 1933.

It was in his capacity as assistant to the vice president in charge of sales, production, and service of Servel Electric Refrigeration Co., New York (predecessor to the present-day Servel, Inc., of Evansville), that Mr. Kylberg first achieved prominence in the refrigeration field.

At Servel Mr. Kylberg's duties included supervision of the sales organizations, formulating sales programs, and development of the budget control system.

When Servel was taken over by receivers in 1926, Mr. Kylberg left the company to build up and supervise a sales organization for a new company in the field, the Iroquois Electric Refrigeration Co., subsidiary of the Barber Asphalt Co., Philadelphia.

Barber, however, withdrew its refrigeration activities after two years, and Mr. Kylberg went to another specialty selling field in 1929.

In that year he reorganized and coordinated the sales activities of the S. T. Johnson Oil Burner Co.'s eastern district office, and developed merchandising activities for the company in all territory east of the Mississippi. In the same year, he developed a sales organization for the Bettendorf Co., of Davenport, Iowa, in its oil burner activities.

During the first two years of the depression, Mr. Kylberg was back in the refrigeration field as manager of the K-W Co., distributor of major appliances in the New York area.

As business sank to lower depths, however, some of the K-W factory suppliers closed, forcing that company out of business as well, with considerable personal financial loss to Mr. Kylberg.

Since 1932 he has not been able to travel much, owing to the illness of his wife following an automobile accident; he settled down in Maplewood to establish his contracting engineering business.

This business has consisted of modernizing the heating, ventilating, and refrigerating systems of buildings on which banks and insurance companies foreclosed in the northern New Jersey area. This in some cases has involved the installation of air conditioning.

FREE SERVICE . .

NO such thing exists — somebody pays! Free service has caused more failures in the refrigeration industry than all other causes combined. No guarantee given by a manufacturer can compensate you for the cost of service calls. Poor design of the installation and cheap equipment invariably result in a loss.

SERVICE-FREE . .

An installation **Service-Free** is the profitable one. Proper low side design, correct liquid distribution and the best control devices money can buy show the greatest profits.

Why not avail yourself of the facilities offered by a company with a wider experience in refrigerant control than all others in the field combined.

ALCO

ALCO VALVE COMPANY
2620 Big Bend Blvd., St. Louis, Mo.

Moister Began Sales Career in 1923

From a start as a Kelvinator retail salesman in Chicago in 1923, George B. Moister has progressed through sales and executive positions with Kelvinator and Westinghouse to a position today as advertising director for Universal Cooler Corp., Detroit.

Selling refrigeration of a mechanical nature was a real pioneering job when Mr. Moister began his labors with Charles Fenn, Kelvinator distributor, in Chicago in 1923. Only the cooling equipment itself was sold, the units being fitted to existing ice refrigerator cabinets in the customer's home.

All units were mounted atop the cabinet, with big tanks holding the refrigerant. Mr. Moister recalls particularly the trouble encountered in fitting up "top icer" boxes with mechanical units; in this case, the tank had to be laid over on its side, presenting a knotty problems to installers in those early days.

Prices for the cooling equipment alone ran somewhere in the neighborhood of $500, and electrical wiring installation was extra. Few people, Mr. Moister recalls, were willing to take a chance with the new-fangled machinery for keeping foods cold.

Frigidaire was using a sealed unit at the time. Kelvinator used flat belts up to 1925, at which time the V-belt drive was introduced.

With Mr. Fenn, as treasurer of the distributorship, was R. E. (Denny) Densmore, now range sales manager for Norge Corp.

Late in 1923, Mr. Moister was appointed sales manager of the Chicago distributorship. The year following, he came to Detroit as state supervisor for Kelvinator; than he went on the road as district sales manager.

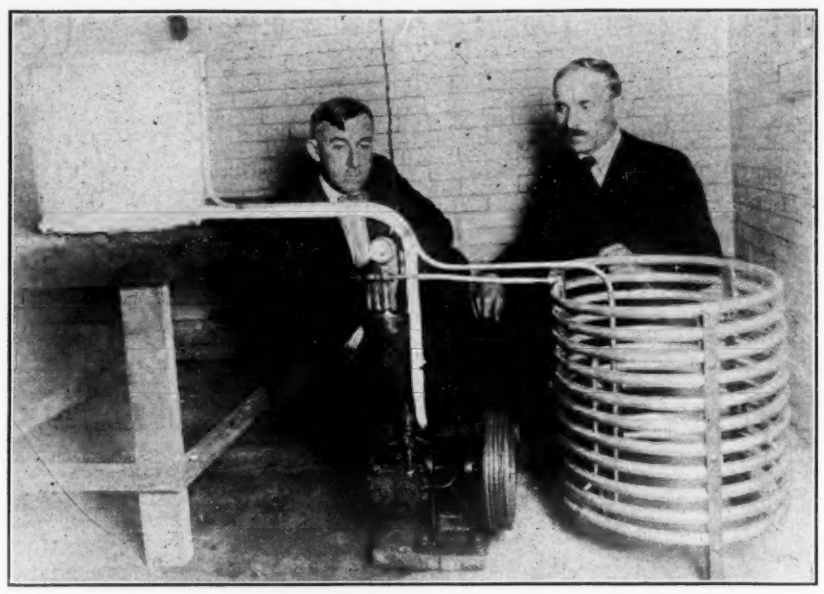
In 1926, he was named Kelvinator's sales promotion manager. The Kelvinator head office was then located on West Fort St. in Detroit. This position he held for three years, traveling in the eastern territory for one year, and on the west coast for two.

Leaving the Detroit office, he became vice president and general manager of Kelvinator's Philadelphia branch, a position he held during 1929 and part of 1930. Later in the same year, he was named refrigeration sales promotion manager for Westinghouse Electric & Mfg. Co., leaving there in 1931 to enter private business.

He returned to his first love, however, in 1935, accepting a position as manager of the Kelvinator Chicago branch. From this post, he came to Universal Cooler in 1935 as director of advertising under President Frank S. McNeal.

Mr. Moister represented Kelvinator at the meetings of the Society for Electrical Development in 1925 and 1926, the first attempts at cooperation made by the members of the hustling young industry. F. M. Cockrell, publisher of AIR CONDITIONING AND REFRIGERATION NEWS, was secretary of the society.

In the Days before the War



Well remembered for his eccentricities by those who were pioneering the small refrigerating machine was Fred Wolf, Jr., (left in picture) engineer, designer and promoter. He developed all kinds of designs and machines and a plan for the customer to assemble the unit.

Brandel Gained First Experience with Isko; Has Specialized in Opening New Markets

Best known, perhaps, as a sales engineer whose chief interest is the opening up of new sales territories, O. A. Brandel, chief engineer for Gilfillan Bros., Inc., Los Angeles, Cal., has been connected with the refrigeration industry for the past 18 years.

Brandel began his career in refrigeration in 1918 while attending the Armour Institute in Chicago. At that time he joined the original Isko Co. under Fred Wolf, developer of the Fridger and Kofax machines and president of Fridger, Inc., Chicago.

After he had graduated from the Armour Institute, Brandel entered the Kelvinator organization, with which company he remained in the field for two years. He then joined the original group of Servel engineers.

Brandel left Servel and returned to Kelvinator, being given charge of sales in Northern California. Wanting to get away from service troubles he left Kelvinator a year later and obtained a position with the General Electric Corp.

Says Brandel, " . . . the idea of getting away from service troubles . . . . did not pan out, as I found there was no chance to get away from refrigerator service troubles unless one gets out of the business."

Brandel joined the original Norge distributor branch set up on the West Coast in 1928, and after two years he was invited to become chief engineer of the Norge factory in Detroit. He accepted the offer and remained with Norge for about a year.

Since 1931 he has been chief engineer of the refrigeration department of Gilfillan Bros., Inc., Los Angeles.

Brandel's engineering activities have been secondary.

His work in the refrigeration industry has been mainly in connection with the development of markets in new territories.

Heideman Produced Unit with Wolf in 1912; Some of His Early Designs Still in Use

Fred J. Heideman, of Detroit, is numbered among the first pioneers in the development of electric refrigeration. In 1912 Mr. Heideman joined Fred W. Wolf, of Chicago, and produced a refrigerating machine known as "Domelerey."

Some time later Henry B. Joy, of Grosse Pointe Farms, took over this machine, naming it the "Isko," and Mr. Heideman was engaged as chief engineer of the new company. Operations were conducted in the old Peter Smith Heater Building, Detroit.

With Mr. Joy's financial assistance, more tests and intensive research were made possible. Mr. Joy himself often worked all night with Mr. Heideman.

During that time the first copper fin tube condenser was developed, also a wafer type discharge valve for compressor use, and a rotary shaft seal. H. V. Higley, a graduate chemical engineer, now of Ansul Chemical Co., Marinette, Wis., contributed a great deal of research to make possible the use of sulphur dioxide as a refrigerant.

E. C. Robinson, Detroit manager of Century Electric Co., helped in the development of suitable motors for refrigerating machines.

After having sold more than 1,000 units all operations of the Isko Co. were stopped in the fall of 1915.

Mr. Heideman then joined the original Kelvinator Co. organization, which was financed by A. H. Goss. After analysis by Mr. Heideman, most of the refrigeration parts developed by this organization up to this time were discarded as unfit, except the condenser.

Mr. Heideman then designed and built the unit known as the "Freezerator." This machine was approved by Smith, Hinchman and Grylls, for the J. L. Hudson Co., Detroit. This was claimed to be the first refrigerating machine placed on the floor of the J. L. Hudson Co. store, or any retail store of like character.

During this time Mr. Heideman also designed and developed the shut-off valves with gauge seal openings which were used on his Freezerator in 1919, and which valves are still in use by refrigerator manufacturers up to the present day.

In 1919 Mr. Heideman was joined in the Freezerator venture by P. M. Fowl, H. R. Kreuger, T. C. Whitehead, Dubois Young, and Roy Manson, all of Detroit, and also by George Steinley, of Madison, Wis. Mr. Fowl, president of the company, died in 1921.

The Freezerator Co. had then made and sold several thousand units. After Mr. Fowl's death the firm was sold to the City Ice and Fuel Co., Cleveland, Ohio.

Some time later Mr. Heideman joined Thomas Whitehead, of Detroit, who had done some interesting work on a unit of his own. Several models had been completed and many changes were made. Finally Mr. Whitehead sold his interests to the U. S. Radio & Television Corp. (which has since been absorbed by General Household Utilities, Inc.).

Mr. Heideman then acquired several consulting accounts, among them being Frigidaire Corp., Crosley Radio, Warner Products, and others. Later Mr. Heideman developed the Aerflo system of refrigeration and air conditioning, and his most recent development is refrigeration and air conditioning for motor trailers.

Lindsay, Pioneer in Developing Insulation, Now Battles for Proper Testing Methods

Harvey B. Lindsay, inventor of the Dry-Zero form of refrigerator insulation, is well known throughout the industry both for active promotion and development of his product, and for his numerous controversial articles which have appeared in AIR CONDITIONING AND REFRIGERATION NEWS over a period of several years.

As president of the Dry-Zero Corp., Chicago, Mr. Lindsay is familiar to thousands of dealers, distributors, and manufacturers. He might be referred to as a scientist with a flair for merchandising, with the inventive element in him predominant.

Two decades ago Lindsay undertook a study of the action of heat and moisture on insulation and formed his "Theory of Contained Specific Surfaces Resistances." Then he began a search for a raw material best suited for the purpose of insulation according to his theory.

After testing more than a hundred materials he selected certain varieties of the seed fiber of the tropical Ceiba tree because they combined to a unique extent high internal specific surface resistance, permanent resilience and high aversion to moisture.

With the resultant insulation ready, Lindsay organized the original Dry-Zero Co. in 1921. He soon realized that the product he had developed was far from perfection because the fibers were not "grained"—that is, made to run in the same direction and across the line of heat flow.

During the next two years Lindsay worked on the problem of "graining" the fibers, and solved it in 1924. Dry-Zero then became affiliated with the American Hair & Felt Co., which made insulation for railway passenger and refrigerator cars, and the first "grained" Dry-Zero Blanket insulation was supplied to the railroads.

In 1924, the railroads built 200 refrigerator cars with Dry-Zero insulation, and in the latter part of the year the Dry-Zero Corp. became a subsidiary of the American Hair & Felt Co., with Lindsay as president.

Between 1924 and 1927, Dry-Zero insulation was sold almost exclusively to railroads.

Although he had no active connection with sales, Lindsay insisted that the other fields, including the electric refrigeration industry, should be buying Dry-Zero insulation. So persistent was he that the sales problem was turned over to him.

In 1928 the first sales of Dry-Zero insulation to an electric refrigerator manufacturer were made, and Lindsay began stepping up sales promotion.

By 1930 Dry-Zero insulation was beginning to be recognized in the refrigeration industry, and by 1931 a considerable percentage of electric refrigerators were equipped with Lindsay's product. It is claimed that in recent years between 30% and 40% of all electric refrigerators have been insulated with Dry-Zero Pliable Slab, and that the production for 1936 is 36% ahead of that of last year.

While the business side of Lindsay's personality was very active, the scientist also was busy. To study refrigerator durability he opened the Dry-Zero Laboratory in 1932, with means of testing refrigerators to determine their efficiency after years of ordinary kitchen use.

The work of the laboratory was studied by many manufacturers and by such independent organizations as the Electrical Testing Laboratories, with which Lindsay carried on long discussion regarding the establishment of proper testing methods. Against pleasing appearance and poor performance, Lindsay began advocating the development of methods of demonstrating refrigerator efficiency and durability as an aid to merchandising of good refrigerators.

THE SATURDAY EVENING POST
SEPT. 19, 1936
50 Seconds add a lifetime of RUST PROTECTION
There can be only ONE First
PARKER
For your benefit...
HOUSEHOLD APPLIANCE MANUFACTURERS are increasing the use of BONDERIZING
Buy that new REFRIGERATOR
...But be sure it's PARKER RUST-PROOFED

FOCUS THE *FORCE* OF THIS ADVERTISING ON YOUR DEALER'S SALES FLOOR . . .

EVERY reading prospect for your merchandise is aware of the value of Parker Processes.

For years, substantial advertising in the Saturday Evening Post and other national publications has been informing the public about the rust preventing and finish protecting qualities of these scientific methods of treating products made of iron and steel.

Take advantage of this accumulated sales force for your line. The refrigerator or other electrical device that is advertised as "protected by Parker Processes" takes on added value. It is assurance of rust-free operation and continued finer appearance for the life of the unit.

Focus the attention of the sales force on this valuable selling feature.

PARKER RUST-PROOF COMPANY
2197 E. Milwaukee Ave. • Detroit, Michigan

For more than 21 years, we have devoted our entire time, talent and energy to the improvement of rust-proofing methods. A book showing what a refrigerator salesman should know about Bonderizing is available. Write for one today.

PARKER
RUST-PROOFING
processes
PARKERIZING • BONDERIZING

E. T. Williams' 1914 Machine His First Step in Long Line of Household Refrigerator Patents

By Winifred B. Hughes

NEW YORK CITY—Way back in 1912 or 1913 when the utilities were looking at refrigeration's possibilities with an eye toward developing their kwh. load on electrical appliances, a number of New York utility executives importuned E. T. Williams, now consulting engineer for Servel, Inc. to devise an electrical refrigerator for domestic use.

They kept at him for a couple of years, and in 1914 Mr. Williams designed and built his first electric refrigerator. It was small refrigerator employing a rotary compressor. The unit was mounted on top.

Mr. Williams saw in his machine limitless future possibilities, so that when his banker offered to put his entire resources behind the machine, as did other men prominent in the electrical industry, Mr. Williams refused.

Wanted Business for Himself

He wanted, he admits, to keep the business himself. But Mr. Williams' capital, while plentiful, could not compete with that of major manufacturing companies who had enormous capital and who had their engineers experiment with household refrigerating units.

Such manufacturing enterprises sprang up like mushrooms, and with their progress, Mr. William's one-man fight to maintain a solitary position was naturally doomed to failure.

But this did not curtail his efforts towards perfecting household machines, promoting their sales, and designing new apparatus on which he took out a great many patents.

From his father, a Methodist minister and an engineer, Mr. Williams inherited his feel for things mechanical. He had no formal education along engineering lines, nor did he attend any of the local technical universities. His education was self-directed, and he studied intensively for many years.

Bridge and Golf for Leisure

His chief divertisements include bridge—we imagine his game must be both profitable and pleasurable—and golf, which he has lately had to forego due to an injured hand.

The injury happened when he was mixing cocktails for a group of his friends in a syphon shaker which exploded. While having his hand put together, a matter of a couple of hours, Mr. Williams' inventive mind figured out a simple, inexpensive device which would make the cocktail shaker absolutely safe.

He is energetic; his actions are quick, and he uses many gestures while talking. If discussing one of his inventions, he uses his pencil to rapidly point out the operation of some mechanical device, and explains so plainly that even the complications of shaft seal patents become intelligible to the neophyte.

Lacks Desire to Make Money

Perhaps the one characteristic which seems to be entirely lacking from Mr. William's makeup is the desire to accumulate wealth. On most of his numerous patents, of which he has nearly a hundred, he has not made a cent. This aspect of the subject irks him; he'd rather not bother thinking about it, one gathers. His open acknowledgment of the fact that he should have made fortunes seems prompted by a feeling that he should be sorry, and isn't really.

Mr. Williams' published works include an article entitled "Shaft Seals for Small Refrigerating Machines," which appeared in the March 1922 issue of *Refrigerating Engineering,* and a paper on "Refrigeration Hazards." He is a member of the ASRE, the Engineers Club of New York city, the Westchester Country Club, and others.

Extremely reticent in reviewing the progressive steps of his work in the electrical industry, Mr. Williams' natural enthusiasm gradually broke down the barrier and he gave us the following account of his work.

"I was with the New York Edison Co. about 13 years as superintendent of the third district which included the United States powerhouse," Mr. Williams stated. "I left this to become assistant manager of the Clark Scales Co. Then I had an offer from the Singer Mfg. Co. to take charge of its Peabody factory which manufactured thermostats. At the same time I had an offer to become general sales manager of the Singer Ice Machine Co. I accepted the latter. At that time Westerberg and I went into partnership."

Singer Made Ice Machines

The Singer Co. manufactured a full line of machinery, both electric and steam driven, from ¼ to 20 tons ice making capacity.

The company was considering taking on a new type of German manufactured machinery.

The machines, Mr. Williams stated, were faulty in design and the new firm (Williams and Westerberg) took a couple of years in which to redesign the machines and get them in good shape.

"About this time, Fred Kimbell, of the company's fractional horsepower motor division was endeavoring to secure small motor business for small commercial and household machines."

Mr. Kimbell succeeded in interesting A. M. Young, Allan W. Page, and some other men in forming the Federal Automatic Ice Machine Co. which took over the assets of the Singer Co., and later incorporated the Ballentine Co.

Federal Automatic Co. Organized

This Federal Automatic Co. was later reincorporated under the name of Federal Automatic Refrigeration Co. Later this company was reorganized into the Automatic Refrigerating Co. now located in Hartford, Conn.

Williams and Westerberg then took the combined company's patents—of which there were approximately 70—and designed a machine incorporating what they considered the best in the various designs.

"We spent about two years testing and investigating various systems and controls before the machine was completed," said Mr. Williams.

At that time Williams and Westerberg had a verbal understanding with the manufacturing company that they were to continue as general sales agents for the new outfit as soon as the equipment was ready for marketing.

"But the Federal Automatic people later decided to do their own marketing, and Williams and Westerberg were left out of the picture," Mr. Williams added.

Sells Appliances as Sideline

However, the firm continued as engineering contractors, principally in the electric refrigerating field. Its work also included engineering in other fields, especially electric motors and generator parts, and gas engines. At that time many buildings in New York changed over from private electrical plants to central service. Williams and Westerberg specialized in this work.

In addition to this work, Mr. Williams had also formed, as a side line enterprise, a little corporation called the Rex Sales Co. The firm sold electric appliances, especially those in the heating equipment line.

Along about this time, Harry Seaber who was a representative for the Eden Washing Machine Co. in New York, came in to see Mr. Williams' and wanted him to place an order for 200 of the washing machines which were using gear train operations instead of belts, as were more commonly used on washing machines.

"So the firm (Rex Sales Co.) put in the order," said Mr. Williams. After this Seaber decided that the order justified the building of a factory that could meet increased production, and started working on the idea.

"The Rex Sales Co. did a nice little business, made up principally of small accounts, but I got tired of that; I've no aptitude for things of that sort, so I sold out my interests in it."

Try to Interest Marshall Field

Next step in Mr. Williams account had to do with another visit of Mr. Seaber.

"He and a man named Zimmerman had been handling Servel ice machine equipment by the Machen Hercules Corp., Evansville," he said..

Mr. Seaber wanted Mr. Williams to take over the Eastern district agency, which was in bad shape financially.

Mr. Williams would not take the agency at this time, but he gave Mr. Seaber an order for a carload of equipment. But even this order wasn't enough to tide the shaky eastern district branch over its financial crisis, and Mr. Seaber again came to seek Mr. William's help.

This time he wanted Mr. Williams to go with him to see Marshall Field, and tell him what he thought about the Servel machine, which the company was merchandising.

"We went to see Marshall Field, and he was interested in the proposition, but requested time to have his engineering corps investigate the machines, before backing them," Mr. Williams related.

"But Seaber had to have the money right away, so we went elsewheres," Mr. Williams recalled.

Asked to Be Servel President

The money was finally obtained from interesting a group of men, among whom were Ray Lillibrind, Paul Plunket and Albert Penchot These men underwrote the firm, and it was put on its feet, bought outright, and became Servel, Inc., Evansville, Ind.

Next the Servel Corp. in New York was organized, and Mr. Williams was asked to be president of it. His answer was that if it wouldn't require too much of his time, or too much work, he'd accept. "So I did," he commented.

Later the parent company was reorganized with a capital of 20 million dollars behind it. At the reorganization, H. G. Scott became president (Penchot and Seaber had been executive officers of parent company preceeding this). The New York agency was then closed out and Mr. Williams asked to become consulting engineer. His answer was similar to that given before, and he accepted the position, which he still holds today.

"This is a pretty complete account of my connections in the refrigeration field," said Mr. Williams.

Leatherbound Book of Patents

When we asked Mr. Williams to tell us something about his patents, he said:

"Patents! I hate the word."

But he opened the bottom drawer of his desk and pulled out a huge leather-bound folder, and his actions seemed to belie his words as he turned the pages, rapidly explaining different machines which he invented, only casually referring to the sketches, or using a pencil to point out some detail.

One of his early patents was for an ice making and harvesting appliance. The previously used method was such that the ice sometimes had a core of the residue material, or that the ice became opaque, or "tombstone-like" in the freezing process.

"I wanted to get away from this core," Mr. Williams added.

Mounting a number of cans over the reservoir which opened to the cans, and having the water fed in from below, was the first step in this invention. An air pocket between the bottom of the can and the surface below kept the water from freezing to the bottom of the can.

During the freezing, all impurities released from the water being heavier than the liquid, dropped through the opening to the reservoir, resulting in perfectly clear cakes of ice which had no core.

Ship Loading Device Never Used

Mr. Williams' first patent, he told us, was on a double door hopper gate for coal and ash and other types of chutes. This applied for Sept. 11, 1901, and it was issued as Patent No. 689,444, Dec. 24, 1901.

Next, patent No. 780,083, issued Jan. 17, 1905, was a vessel for bunkering and loading ships.

"This patent was never put into application, because the head of the stevedores here said that they'd wreck any boat I brought into the harbor with it on, so I never brought it out, but it was a dandy," he said.

In 1908, Mr. Williams invented ice-making apparatus involving a plate ice system using electricity to release cakes of ice made in big tanks of water at both sides of the freezing coils. The cakes were from 10 to 12 lbs. in size. (Patent No. 882,224 issued March 17, 1908.)

But refrigeration was by no means the all-inclusive object of Mr. Williams' inventive interest. One gathers from his patents that few electrical or mechanical devices did not come within his scope as an inventor.

In collaboration with H. D. Bernhard, Mr. Williams designed an automatic refrigeration system (Patent 1,050,894, issued Jan. 21, 1913) which, Mr. Williams stated, the patent office named "the Everything patent."

The chief examiner referred to it as being mentioned more than any other patent issue on refrigeration.

Shaft Seal Inventions

Mr. Williams invented two shaft seals still commonly used in refrigeration. The first of these, No. 1,292,197, issued Jan. 1, 1919, had as its title "Gas-Tight Seals for Compressor Shafts." In this, he explained, the sylphon members of the bellows were secured to the shaft and revolved with it.

The other of the two shaft seal patents (No. 1,327,002) was issued Jan. 6, 1920. The sylphon member was secured to the machine casing and seal, secured to and revolving with the shaft. In these patents, he told us, are contained the fundamentals of every motor-driven compressor since brought out employing a bellows seal.

"I should have collected millions of dollars on these two patents, and I never got a nickel," Mr. Williams commented.

Still Has Original Model

In addition to these Mr. Williams has had numerous other inventions patented. Two of them have been on magnetic clutches which eliminate the necessity for a packing box or shaft seal. The compressor is driven through the casing by means of a magnetic flux, and the mechanism lacks clutch members altogether. These patents were issued Jan. 5, 1926, and numbered 1,568,304, and 1,568,305.

Mr. Williams still has one of the two original models in his office. He carefully pointed out the operation of the model parts, explaining that it was originally designed for AC current, (there was little DC used then).

"If all current had been DC, I'd have put the machine out in a big way," he added.

A number of rotary compressors were the next things which Mr Williams built.

"Here is something very unique," he said, turning the next page in his patent folder.

He was speaking of a solenoid reciprocating compressor, Patent No. 16,693, issued Aug. 2, 1927, and the second re-issued Dec. 10, 1935 (title: Compressor Patent No. 2,023,799.)

"The main feature of this type of compressor," he continued, "is that the actuating solenoid member is mounted at right angles to the piston; the connecting train to the piston is a system of connecting leaks forming a toggle which osculates the vertical center, thus maintaining a fixed clearance between the cylinder head and piston on the discharge stroke. On suction stroke the distance traveled is variable, depending on the amount of load it is operating against."

"This feature," added Mr. Williams, "is entirely different from the characteristics of compressors formerly used, in that the compressor no longer has constant volume displacement at constant speed; it will deliver substantially the same capacity at both high and low temperatures where the condensing temperature is the same."

This compressor apparently was the first in which, when operating at constant speed, the displacement varied responsively with load variation, he told us. The speed is definitely fixed by the frequency of electric current; the power input is constant; the only variable, therefore, is the distance traveled by the solenoid and piston in a given time, he explained.

1907 Air-Conditioning Installation

From this subject Mr. Williams' conversation naturally turned to air conditioning, and questioning brought out several of his inventions in this field.

"My first air conditioning installation was in the Boston Floating Hospital in 1907," he stated. Contract for this job required the supplying of 8,000 c.f.m. to maintain five hospital wards at 70° F. dry bulb temperature, and 50% relative humidity. (When the outside air was 88° and relative humidity 85%). This installation was patented as No. 19,700, reissued Feb. 20, 1934. The load on the ward installation called for 65 tons of refrigeration. The contract also required five tons refrigerating capacity for food preservation.

In the years that followed Mr. Williams installed many air-conditioning systems, some of which were for chocolate manufacturers and other large industrial concerns.

Oil Return Devices

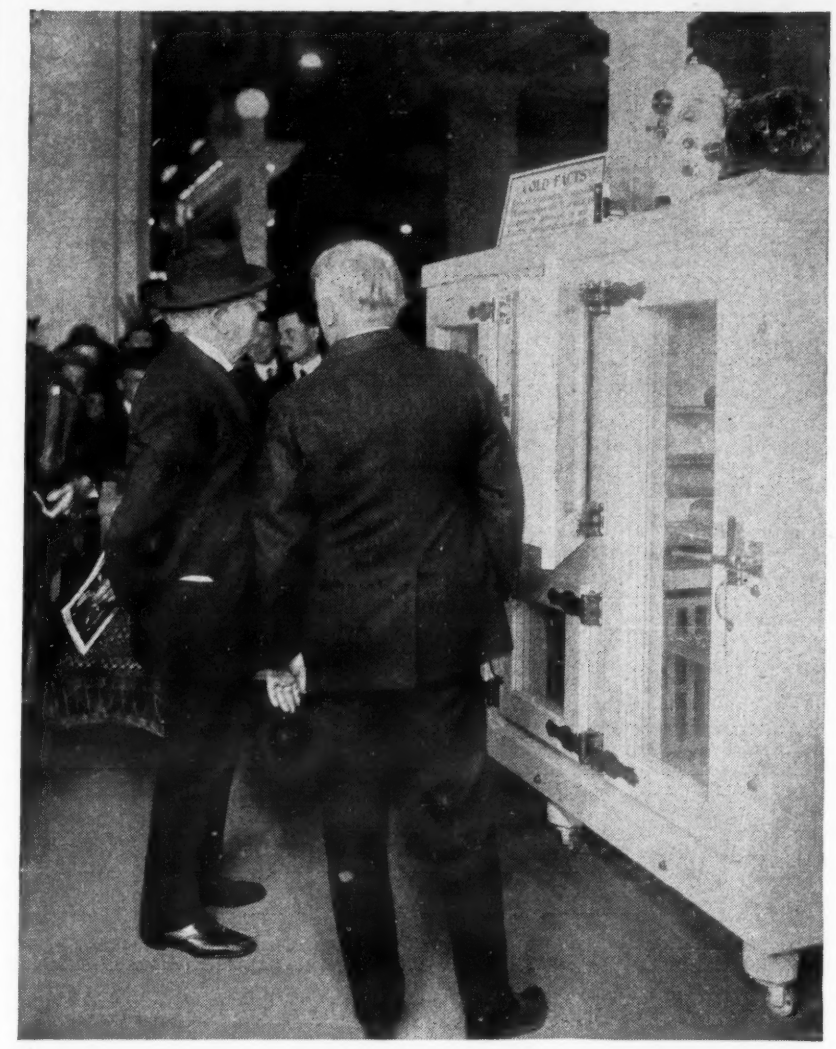
His patents in this period included those on oil return devices and lubricating systems, including an oil feeding or metering device covered by patent No. 1,895,092, issued Jan. 24, 1933.

One of the claims of this patent, Mr. Williams explained, read: a metering device comprising a body having a threaded bore, a threaded stem for connecting with said bore a portion of threads of bore coupled with threads of stem to define a fluid channel. This device permits an extremely fine graduation of the feeding of the lubricant, and permits clearing of any obstruction in the channel without opening the system.

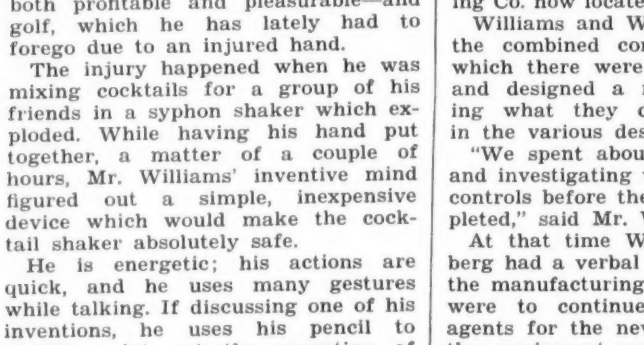
Mr. Williams described next a patent which he considers the most important in his files. It covers a safety system for large refrigeration installations (Patent No. 1,947,574, issued Feb. 20, 1934, and applied for in November, 1929.) It is, he claims,

(Concluded on Page 25, Column 1)

Edison Inspects Williams' Machine



Thomas A. Edison visited this refrigeration display at Grand Central Palace, New York, and showed considerable interest in the machine built by E. T. Williams, pioneer refrigeration engineer. The picture is believed to have been taken in 1917. Probably no present manufacturer exhibited.



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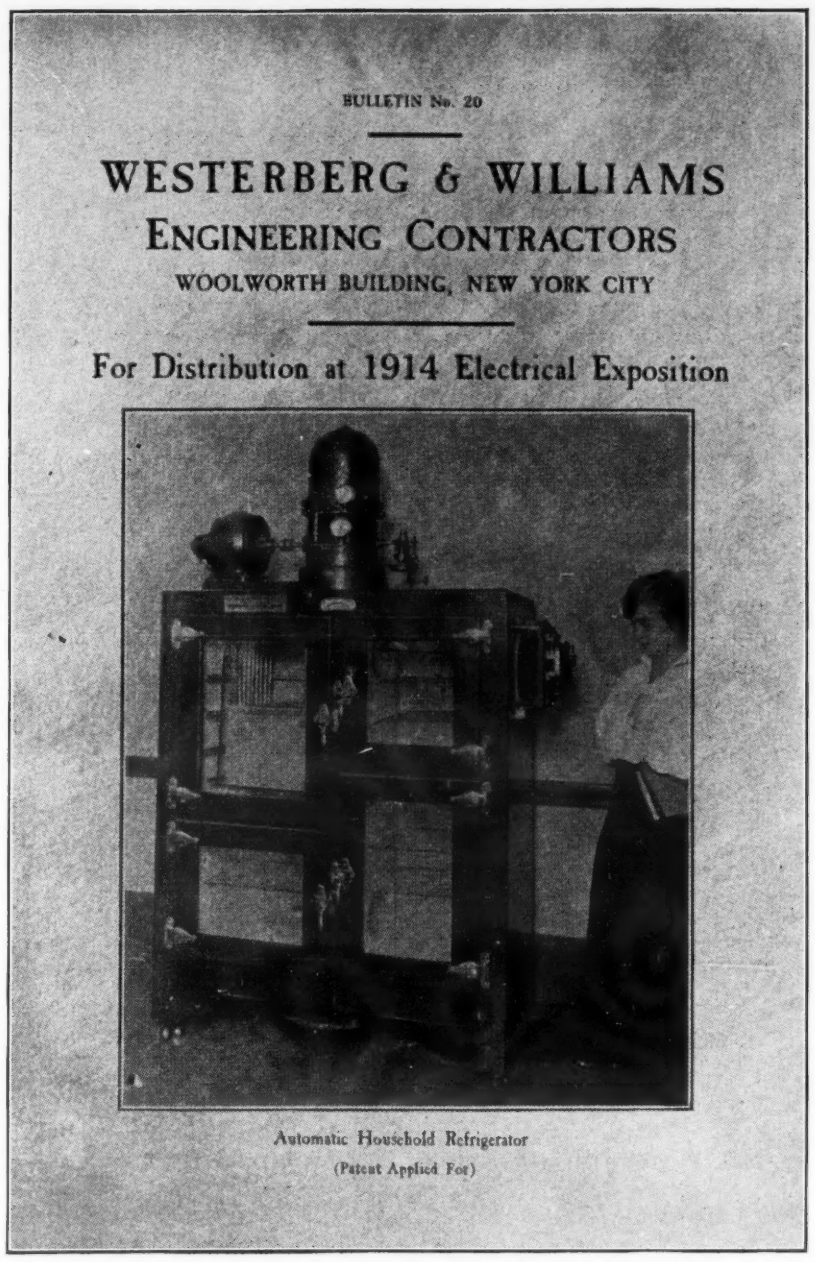

BULLETIN No. 20

WESTERBERG & WILLIAMS

ENGINEERING CONTRACTORS

WOOLWORTH BUILDING, NEW YORK CITY

For Distribution at 1914 Electrical Exposition

Automatic Household Refrigerator

(Patent Applied For)

Early bulletin issued by Wisterberg & Williams, pioneer manufacturers and installation engineers in automatic household refrigeration.

Williams' Alarm System for Detecting Leaks Of Refrigerant Exhibited to Chicago Officials During 1929 Code Fight

(*Concluded from Page 24, Column 5*)

the one which the industry doesn't like.

Design for this patent was made to meet the Chicago safety code sponsored by Dr. Arnold Kegel, health commissioner, in 1929. Provisions of the code proposed that any multiple system which could leak more than two lbs. of refrigerant in 12 hours on the breaking of any part of the system, was prohibited.

"When this proposal was made at a public hearing it was objected to by a majority of the committee of manufacturers appointed to cooperate with Chicago authorities in formulating a safety code, on the ground that while such a system might be devised, it would require too many delicate devices which in themselves, might constitute a serious hazard—" Mr. Williams commented.

When asked by the chairman as to the possibility of providing such a system, Mr. Williams agreed that if delicate complicated devices were necessary, they might constitute a serious hazard, but that he believed that such a system could be devised without any devices. Asked to construct such a system, Mr. Williams agreed.

Chicago System Demonstrated

He built and installed an evaporator system in the Chicago Avenue Public Station. In this was demonstrated that in cutting the main liquid line all leaks ceased, and an alarm was sounded upon the loss of 1 and ¼ lbs. of refrigerant; on cutting the main suction line a loss of only ¼ lb. of refrigerant occurred.

The control of this system is responsive to loss of refrigerant from the system, he explained. That is, when a pre-determined amount or volume of liquid has escaped, an electrical circuit is closed which causes the instant and simultaneous functioning of various switches and valves which breaks the system up into small sections, shuts down the compressor, and sounds an alarm. A further feature, he added, is that the system cannot again be put into operation until the fault is corrected.

"The Board of Health of Chicago has made it compulsory to use this type of system on all air-conditioning installations in which Freon is employed.

"But the manufacturers seriously object to paying any royalties on this safety device, although it fully covers any system," he added.

In connection with the patent on the safety system, Mr. Williams told an interesting story about its entrance into the world.

After the Chicago meeting, at which he said that he believed a system might be devised, Mr. Williams had not determined to design it. Following the meeting, he had dinner with F. M. Cockrell, publisher of the NEWS, who told him that unless he designed the system he would be disowned in the industry.

"It was Friday night," Mr. Williams remembered, "and Mr. Cockrell said: 'I must have the blue prints by Monday morning to publish in next week's issue of the NEWS.'"

Error in System Shown

So Mr. Williams, challenged, wired the Servel factory to send him a draftsman, and set to work. Despite the complications and interruptions in his office, he completed the drawing, the plan for which, he stated, had come to his mind just as he rose from the dinner table, after Mr. Cockrell's declaration.

In drawing the blue print, the draftsman made a wrong connection, and it was published with the error, in the NEWS, and corrected in the next issue. Meanwhile, one of the manufacturing companies had its engineers set up a similar system. With the wrong connection, it wouldn't work until Mr. Williams corrected the drawing error and proved that it did work.

Many difficulties beset Mr. Williams' demonstration of the new system in Chicago. First of these was finding a place where it might be publicly demonstrated; three or four different locations were named by the authorities, then withdrawn.

Next came the trouble with setting up the machinery. The equipment couldn't be unloaded except by union workmen, so Mr. Williams' own crew, brought from the factory, had to stand by while union men were secured. Then it couldn't be assembled without union help, etc. Four watchmen were stationed by Mr. Williams to guard the system.

"But even at that," he said, "one of the main bolts was stolen the first night. Fortunately, we had four extra ones, so it didn't stop the demonstration."

The troubles didn't end here. Other members of the committee who backed Mr. Williams on his safety proposal were tapped on the shoulder and told to get out of Chicago . . . or else.

Mr. Williams did not impress the writer with the thought that such difficulties had changed his convictions, or in any way daunted his purpose. His eyes sparkled in a way that seemed to suggest the actual emotions which he experienced at the time of his Chicago safety crusade.

But while Mr. Williams' part in the development of the electric refrigeration and air conditioning industry has been great, he is quick to point out others who have had a major share in the work.

To begin with, he disagrees with editorials published in issues of the NEWS this year, stating that the big impetus to refrigeration came following a meeting of the manufacturers at the Westchester Country Club 10 years ago.

According to Mr. Williams, this industry came of age as a result of the interest shown by power companies. He dates this interest from a paper which was presented by T. I. Jones, then salesmanager of the Edison Electric Illuminating Co. of Brooklyn, of which Matt Sloan was president, and president also of the Association of Edison Illuminating Companies.

Titled "Household Electric Refrigeration," Mr. Jones' paper was read before the October, 1922 meeting of the Association of Edison Illuminating Companies.

Previous to its presentation, John W. Lieb, first vice president of the New York Edison Co. and a former president of the Association of Edison Illuminating Companies, requested that Mr. Williams call on Mr. Sloan and ask him to write a paper titled "Increasing the Load On the Household Meter," featuring the advantages to the electric utilities of the domestic refrigerator, and its possibilities for turning household service into a profitable business.

When the idea was first broached to Mr. Sloan he stated that he did not consider the subject one of sufficient interest to take up the Association's time. Later Mr. Williams was told that he could not give the paper because he was not an employe of one of the member companies of the Association. It was agreed that Mr. Jones would prepare the paper in collaboration with Mr. Williams.

After the paper was read, a committee was appointed to investigate the possibilities of electric refrigeration. Reports were submitted at the following year's meetings. Most important of the aftermath proceedings on this idea was the paper presented before the NELA meeting held in San Francisco in 1925.

Electric refrigeration definitely stole the spotlight over all other appliances at this meeting, Mr. Williams told us. Units were displayed, this detailed report read, and all discussion centered on the refrigerators.

From this time on promotion at the hands of the utilities was with a touch that molded refrigeration's continued life and profit-building value. The manufacturers began their work of pushing the proposition only after the utilities had broken ground.

"It was the utilities' baby, and they worked to see it grow," Mr. Williams commented.

Mr. Williams told us also of the work which his brother Arthur Williams, at one time first vice president of the New York Edison Co. in charge of public relations and publicity, and now retired, had done on electric refrigeration.

Arthur Williams, he informed us, was a big factor behind refrigeration's progress in the New York territory.

One of his first projects in the field was allowing the manufacturers early in the game to place their refrigerator displays in the seven large show rooms of the New York Edison Co. He also promoted the annual refrigeration shows held by the New York Edison Co. as early as 1922 or 1924.

For these shows, he personally directed and prepared some of the publicity, bringing domestic refrigeration into prominence. He was later president of the National Electric Light Association, and the Association of Edison Illuminating Companies.

His work as a consulting engineer has led E. T. Williams into many fields and countries. He told us that in 1922 he made a survey of the meat slaughtering, distribution, and storage methods in Spain, at the request of Spain's King Alfonso.

With an unlimited expense account and unlimited time, he worked at the survey from minutest detail to broadest scope. First he studied the people and their buying habits.

"The women used to come to five o'clock Mass with their shopping and I followed them just to see what kinds and quantities of foods they bought.

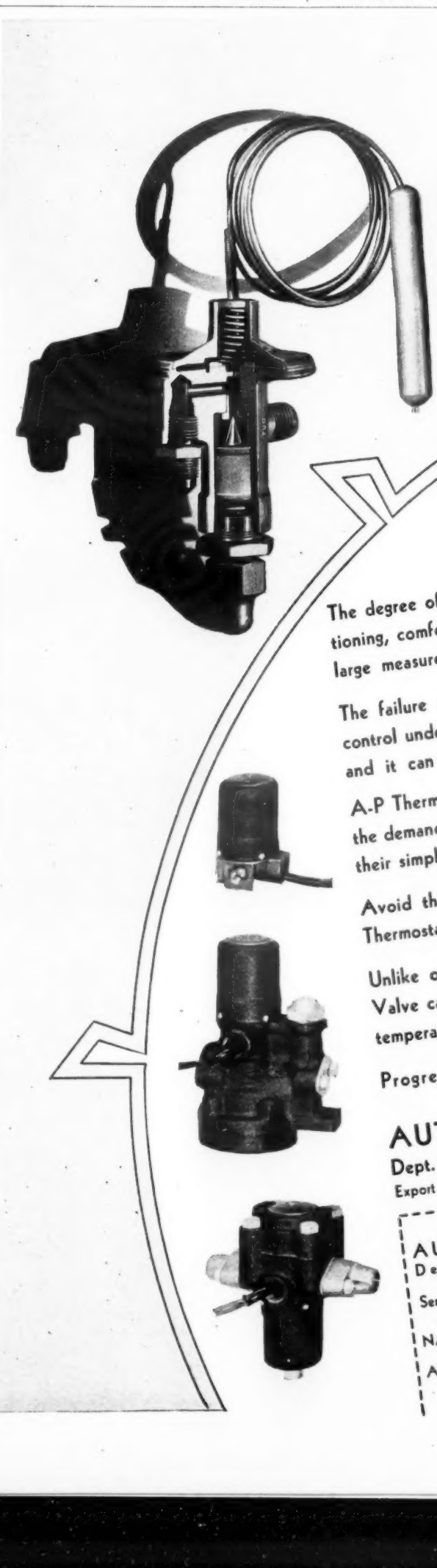
"A woman would move along through the big market section streets, stopping at one stall to buy a stalk of celery, or a few onions, the she would buy a chicken's wing, or a half of wing, and then go home and make her family a stew.

"Slaughtering was not done on the quantity-production basis; the butchers slaughtered their meats in accordance with the next day's demands, an expensive method."

For this situation Mr. Williams designed a storage plant for the city of Madrid, calling for a million cu. ft. storage plant. For the city of Barcelona he designed one half that size.

"I don't know what happened to the plans I drew up, or if they were ever used after I turned them in."

Mr. Williams' work has taken him also to Paris where he designed some equipment for the Paris market.



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Frank Riley's Quarter-Century In Refrigeration Began with Invention of Unit in 1911

By Al Jones

Francis B. (Frank) Riley, one of the real, old-time pioneers in the mechanical refrigeration industry, is today the head of the standard refrigeration appliances division of the American Injector Co., Detroit, Mich.

For 23 years before his association with this company, which dates from May, 1934, he was directly active in the field of refrigeration, inventing machines and devices, originating various methods and principles of operation, developing, manufacturing, and marketing both commercial and domestic refrigerating machines and cabinets and otherwise applying his knowledge and ability to the advantage of a number of firms engaged in the refrigeration industry.

Became Interested in 1911

It was in 1911 that Frank Riley first turned his attention to electric refrigeration. He had always been interested in machines, and was ever ready to "prick up his ears" at the mention or sight of a new mechanism. On a visit to Cleveland in that year he happened to see on display a small absorption ammonia refrigerating unit. He inspected it, appraised it, and decided he could make a better one.

He foresaw the possibilities in such a device, and realized that there was a great field waiting to be developed for the household refrigerator. Accordingly, he set out to obtain all the information he could unearth about all types of machines then made.

Assisted by William Haynor

With this knowledge he began on a unit of his own, having the invaluable assistance of William H. Haynor, also an inveterate machine-tinkerer. Using their combined resources, Riley and Haynor built a domestic machine that operated successfully.

Their 'factory' was a little workshop in Toledo, Ohio; their output for the first year totaled six electric refrigerating units. These, then, were the inauspicious beginnings of a career that was to carry Frank Riley through all phases of the refrigeration business.

Expanded Company in 1913

Since the market for household machines had not been opened up to any great extent, Riley was content to continue the improvement of this type of apparatus, and at the same time concentrate on small, commercial units as a source of income.

His business prospered well enough to warrant extension and expansion; so, in 1913, Riley organized the Refrigeration Engineering Co. A factory was opened in Toledo, the output was greatly increased, the sales force was enlarged, the market was extended farther from home, and Riley found himself to be the "proud father" of a growing concern.

For the next five years the company produced commercial machines at an ever-increasing rate. Then, in 1918, came a stroke of good fortune. The Emergency Fleet Corp. engaged in transporting food and supplies from the United States to the war area in Europe, awarded to the Refrigeration Engineering Co. a contract for refrigerating machines to be installed on the corporation's vessels.

Riley turned the entire production of the company to the manufacture of the required units, producing a model comprised of a compressor, a condenser, a liquid receiver, and a brine tank cooler, using ammonia as the refrigerant and deriving power either from an attached motor or from a directly connected steam engine.

Machines Placed on Deck

These refrigerator units, the only ones approved for use in the war zone, were placed on the decks of the ships, thus eliminating any possible danger that might be caused by a shell hitting the machines and allowing the ammonia gas to escape below decks.

In this same year, 1918, August P. Anderson, designer of refrigerating machinery and developer of the Peerless ice machine, joined Riley's company in the capacity of chief engineer.

Anderson had built a small, domestic unit for Sears, Roebuck & Co. back in 1914. It was a water-cooled machine, used ammonia, had a capacity of 300 lbs., and had its entire mechanism surrounded by a water-jacket. Sears never carried out its intention of marketing Anderson's machine; so he used the same principles and designs in his work for Riley.

1,500 Sold in 1919

In 1919 Anderson constructed a two-cylinder, ammonia machine that proved itself to be practical, and about 1,500 of them were manufactured and sold on the open market.

At this time Frank Riley organized The Toledo Coldmaker Co. All of the assets, property, and rights of the Refrigeration Engineering Co. were acquired by purchase, the stockholders being paid $500,000 worth of preferred stock and a like amount of common stock in the new company for their entire claims.

The new company also secured by purchase the sales franchise rights for the Coldmaker domestic refrigerating unit from The Coldmaker Machine Co. of Toledo.

With an authorized capital stock of $5,000,000 The Toledo Coldmaker Co. was, in 1919, incorporated under the laws of the State of Ohio.

Pending the construction of a new factory on the 7½ acre plot purchased for the purpose, the company was housed in the Refrigeration Engineering Co.'s plant which, though lacking in room for the expanded program, proved to be quite satisfactory as temporary quarters.

There was the company's own high tension, electric power transformer station, and the buildings were safeguarded from fire by an adequate sprinkler system. The proposed new plant was to include, when completed, an electrically equipped, electric furnace type foundry, a pipe shop for the production of the many styles of pipe used in refrigerating equipment, a modern, electric power sub-station, a sheet metal shop, a heavy machine tool shop, a testing laboratory, an assembly, a warehouse, and a stock receiving and shipping room.

An estimated $1,500,000 was to be represented in the enterprise.

Toledo Coldmaker Personnel

The original personnel of The Toledo Coldmaker Co. was:

Directorate:

F. B. Riley, president and general manager.

W. S. Reynolds, vice president and secretary.

H. H. Zimmerman, treasurer.

Directors:

F. E. Calkins, vice president of American Warming & Ventilating Co.

Robert A. Draper, sales manager of Palmer, Blair Co., director of Mutual Savings Association.

Martin V. Kelley, president of Martin V. Kelley Co., president of Northwestern Ohio Savings Association.

David M. Kerr, president of Kerr Machinery Corp., president of Kerr Mfg. Co.

F. B. Riley, president of Toledo Coldmaker Co., director of Hardy Paint & Varnish Co.

C. O. Miniger, president of Electric Auto-Lite Corp., vice president of Willys-Overland.

C. A. Peckham, president of Toledo Bridge & Crane Co., director of Austin Machinery Corp., director of Northern National Bank.

R. A. Stranahan, president of Champion Spark Plug Co.

W. S. Reynolds, vice president of Toledo Coldmaker Co., vice president of Clay Products Co.

Branch Officers and Dealers

The company also established a number of branch offices, distributors, agents, and dealers throughout the middlewest and the east. The branch offices and corresponding managers were:

Philadelphia district, A. E. Lankenau.

St. Louis district, A. K. Gillespie.

Chicago district, A. M. Reilly.

Kansas district, M. A. Nettleton.

Indianapolis district, R. A. Jennings.

Washington district, J. A. Wheeler.

Cleveland district, W. J. Rex.

Detroit district, C. B. George.

Display rooms:

Toledo, 410 Madison Ave.

Cleveland, 1902 Euclid Ave.

Agency offices:

Memphis district, W. D. Smith.

Virginia district, G. A. Mills.

Eastern district, Wright-Ziegler Co., Boston.

Central New York district, Gowing-Dietrich Co., Syracuse.

New Jersey district, Refrigeration Engineering & Supply Co., Paterson.

Special distributors:

Columbus, Ohio, Enterprise Dairy & Supply Co.

Buffalo, Buffalo Butchers Supply Co.

Chicago, A. H. Barber Creamery Supply Co.

Chester, Pa., Chester Dairy Supply Co.

St. Louis, Blanke Mfg. & Supply Co. and Ford Hospital Supply Co.

Indianapolis, Schwenger-Klein Co.

Philadelphia, W. L. G. Smith Co.

Reading, Pa., Reading Machinery Exchange.

Denver, William C. LeBarge.

Funds to extend the operations of the company and to finance the building and equipping of the new factory were raised by placing limited amounts of common stock on sale.

10 Patents Held by Company

From the Refrigeration Engineering Co. and The Coldmaker Machine Co. the successor had obtained 10 patents on refrigeration apparatus, one dating from 1912, three from 1917, five from 1918, and the other from 1919.

They covered a compressor construction, a condenser, a water-jacket, compactness of unit, installation of unit within refrigerator box, an automatic electric control operated by a control motor and thermostat, improvements in ammonia compressors, construction of a small, domestic-type machine, direct connection of the motor to the mechanism of the compressor and simplified production methods of the compressor.

In 1920 a production schedule was formed calling for the manufacture of 2,500 commercial machines and 15,000 domestic units during the following year.

It was estimated that the gross sales for the year should amount to $7,500,000, and the gross profit on this sale, after deducting a liberal allowance for advertising and service charges, was foreseen as being $2,500,000.

After the subtraction of operating charges and dividend payments on stock, the net profit was expected to be over a million dollars.

Contracts for a national advertising campaign were placed with the Martin V. Kelley Co., whose main offices are in New York City, and the advertising program included full-page insertions in the *Saturday Evening Post, Electric Merchandising,* and in other periodicals.

Condensed, a statement issued in 1920 placed the assets of The Toledo Coldmaker Co. at $1,596,428.97 and its liabilities (direct) at $591,428.97. The excess of assets over direct liabilities, amounting to $1,005,000, was balanced exactly by the value of the common stock issue.

The line of commercial units included six different types of machines and 20 different models ranging in size from the one-half to three-quarter ton, automatically operated model "A" to the large, twin-compressor unit of 12 tons.

Bought for Merchant Ships

Orders were placed with prominent shipbuilding firms after the success of the machines used by the Emergency Fleet Corp., and Coldmakers were installed on cargo ships plying the seven seas, operating constantly and giving complete satisfaction.

By July 28, 1920, the company had on hand more than $250,000 worth of unfilled orders and contracts for the installation of Coldmakers. Sales values mounted from less than $25,000 to more than $500,000 per year.

August Anderson and William Haynor were retained by the company for some time, Anderson having designed and supervised the construction of the highly successful Coldmaker.

Having guided his enterprise from a small, two-man workship producing six machines in 1911 up to a national business capable of turning out as many as 20,000 refrigerating units per year, Frank Riley stepped out from the driver's seat to seek new stamping grounds. The Toledo Coldmaker Co. continued its activities until 1925.

After leaving Toledo in 1921, Riley had a brief association with the Absopure Ice Cream Co. of Detroit, where he was in charge of the refrigerator cabinet division.

Late in 1922 he obtained a position as engineer with the Detroit Creamery Co. He designed and developed for them a refrigerating machine for use in ice cream cabinets and in soda fountains.

Attends Code Meeting

In December, 1923, Riley attended a meeting of the refrigeration code committee in New York City, at which the chief engineers of such companies as Kelvinator, Frigidaire, and the like were present. The committee had been in existence for several years, having been organized by the big commercial refrigerator companies, but had never completed its work.

These commercial manufacturers were somewhat disgruntled by the amazing growth of the "upstarts," and thought of a way to demonstrate their own prominence by calling this meeting. The main purpose of the committee was to establish a definite limit on the amount of refrigerant used in the household refrigerators.

At the time, the domestic machines were using varying amounts of sulphur dioxide and ammonia, and it was averred that uncontrolled quantities were dangerous in homes. The commercial refrigerator companies argued that a serious hazard existed in the homes from the effects of escaping gas, and that such a peril should not be permitted on the market.

Various representatives argued at length over the respective "deadliness" of sulphur dioxide, ammonia, and methyl chloride. It was the committee's object to cut the amount of gas allowed in any single unit to a maximum of 10 lbs., in which case two or three of the more important domestic refrigerator companies would have been seriously hurt.

Riley thought it necessary to impress the code committee by making a big production showing, and called on each of the engineers of the domestic companies present to give the approximate number of machines placed in the market by his corporation.

Production Figures Given

Riley believed from his own experience that the refrigerants used in household machines possessed "none of the lethal powers so greatly discussed," and he did not wish to see the household refrigerator industry crippled by an unfair decision.

At his suggestion, then, the estimates were given. Kelvinator's production was placed at 25,000 machines per year, Nizer at 28,000, and Frigidaire at 30,000. These figures were large enough to cause the committee to hesitate (when the argument was presented that, if these machines really were dangerous, a number of deaths would have resulted from so many installations) with the result that the proposed code on small machines was held up for the time being.

Of course, the estimates were very optimistically guessed. Riley mentally cutting them in half to be closer to the actual output, but they served their purpose in staying an adverse decision, much to the advantage of the domestic machine manufacturers.

Goes to Kelvinator and Servel

Riley remained with the Detroit Creamery Co. until 1924, when he accepted a position with the Kelvinator Co. as manager of the cabinet division. A year later he took an office with the Servel Corp. He directed and organized their commercial division in the general offices in New York City.

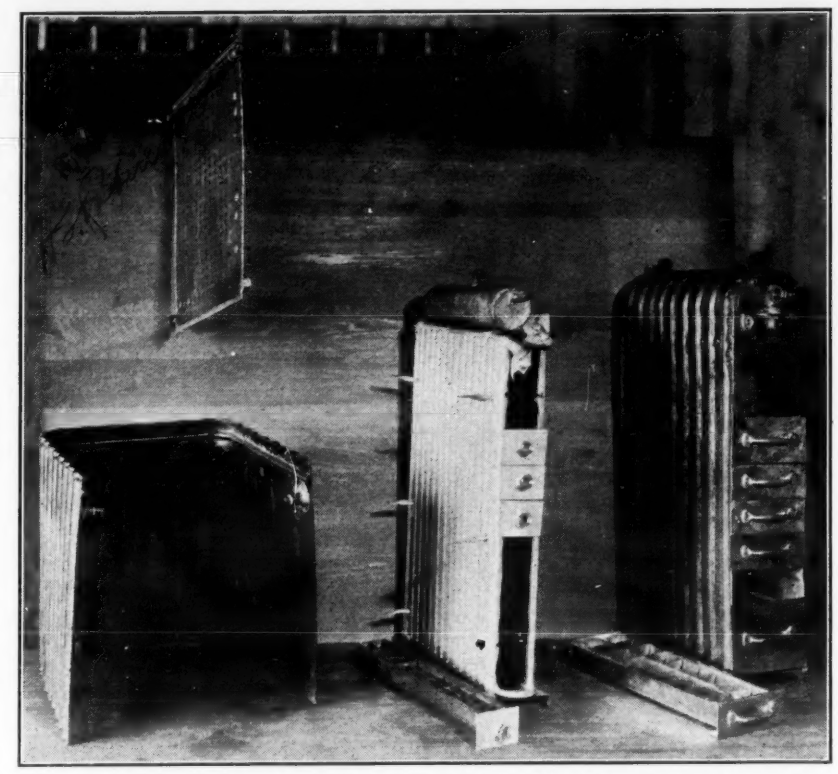
In 1926 he ended his association with Servel, and undertook to merchandise the products of the Fedders Mfg. Co. of Buffalo, the Ranco Controls Co. of Columbus, Ohio, and the Clifford Mfg. Co. of Boston. Sales were made only to unit manufacturers.

From September, 1926, to July, 1927, Riley was technical editor of ELECTRIC REFRIGERATION NEWS.

For more than seven years Riley was with the Fedders Co. He left to assume his present position with the American Injector Co.

Twenty-five years of activity in the mechanical refrigeration industry is the record of pioneer Frank Riley. A quarter of a century of inventing, developing, designing, manufacturing, selling, and improving refrigerating machines is behind him—and he still is a comparatively young man.

First Sheet Metal Evaporators



One of the early developments in electric refrigeration—complete sheet metal evaporators. This equipment, photographed in Grand Rapids, Mich., in the spring of 1925, was developed by D. C. Heath, now chief engineer of the air-conditioning division of McCord Radiator & Mfg. Co. The four evaporators shown were placed in refrigerators and demonstrated to Charles Leonard, then president of Leonard Refrigerator Co.

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Replogle Tells of Frigidaire's Beginnings in Refrigeration And of Early Problems

The name of John R. Replogle is one which "oldtimers" in the industry will recognize as standing out in the history of two companies which played so important a part in the early development of the small machine industry —Frigidaire and Nizer.

Mr. Replogle, now a consulting engineer in Detroit, is perhaps the only living man who can give the complete story of the beginnings of Frigidaire Corp.

Frigidaire had its origins in the Guardian Frigerator Co. of Detroit, which had been formed by two men who had come from the factory in Ft. Wayne, Ind., that was making the Audiffren refrigerating machine.

W. C. Durant bought the Guardian Frigerator Co. about 1917. Only about 50 of the Guardian machines had been made, and these were "placed" in the homes of prominent people rather than sold, Mr. Replogle relates.

Frigidaire Name Adopted

Shortly after its purchase by Durant the company became known as the Frigidaire Corp. Mr. Replogle isn't sure as to how the name "Frigidaire" came into being; he thinks it was probably originated by Ben M. Stoddard, whom Durant had named as president of the company, and who was a sales-minded individual of the type that might have thought up such a name.

Durant had purchased the company as a personal interest, but he soon sold it into General Motors, in which he still was a big factor, and production got underway on a fair-sized scale in 1917 and 1918.

Held Up by Improper Operation

"They got about 1,000 to 1,200 of them into the field before production was held up because of complaints of improper operation made by users," Mr. Replogle relates. "This was very annoying and embarrassing to Mr. Durant because he had placed the machines in the homes of many of his wealthy friends."

Durant was a man of action. He called J. Parker B. Fiske, a graduate of the Massachusetts Institute of Technology, to the presidency of Frigidaire Corp. and ordered the research laboratory of practically every division of General Motors to make tests on the Frigidaire unit to find out what was wrong with it.

Replogle Appointed in 1919

Fiske had been head of the Sunny Home Electric Co., which was developing an automatic farm home lighting plant. Work on this product had been done in the old Remy laboratories in which Mr. Replogle was working at the time, So Fiske was acquainted with Replogle.

The old Remy laboratory had become the central G-M laboratories and there Mr. Replogle and his assistant, the late Frank Wurl, had been doing some of the required test work on the Frigidaire. Fiske selected Replogle to take charge of Frigidaire engineering in 1919.

'Find Out What's Good'

"It was more a case of trying to find what wasn't wrong with the unit, rather than attempting to discover what was wrong," says Mr. Replogle.

Durant was generous in his expenditures on research work. In fact, Mr. Replogle says he was almost fired because he couldn't spend $1,000,000 a year on engineering research.

"If you can't spend that much money," said Mr. Durant, "you're not a big enough man for the job."

The Model "B" Frigidaire was put on the market in 1920. This was a new design incorporating as many of the old parts as possible. Mr. Replogle has one of the three engineering samples in the basement of his home. It was a large, three-compartment wooden box, well-constructed on a heavy framework. The unit was in the bottom.

'Michigan Air' for Insulation

Cork was used for the insulation. Considerable argument was necessary to convince officials of the Grand Rapids Refrigerator Co., ice box manufacturing firm which made the cabinet, that such construction was necessary—their contention being that there was no insulation like "good old Michigan air." The refrigerator came complete with metal ice cube trays, and retailed for about $750.

Soon after Model "B" was introduced a third model, re-working the Model "A" and using the "B" system was introduced, and called Model "AB."

2-Cylinder Compressor

The unit was comprised of a twin-cylinder compressor with a 2¼-inch bore and 4¼-inch stroke encased in a dome (see illustration) together with the condenser. The compressor was driven from a motor by a worm-gear drive. The lower part of the area covered by the dome acted as the receiver.

The control arms, one of which started and stopped the machine operating off of suction pressure, and the other which acted as a water control, were instruments of considerable magnitude (see picture) and operated out in the open.

Held Many Patents

Mr. Replogle had patents on many of the details of this machine and the type of refrigeration system which it comprised, particularly with respect to the lowside float (operating in a flooded system), and use of the suction pressure control.

By 1921, says Mr. Replogle, the business was moving along at a good pace. Sales branches were established in the principal cities (there were no independent dealers in those days), and Frigidaire made its first installation of self-contained refrigerators for an apartment house, 84 machines being installed, in the Indian Village Manor, Detroit.

In 1921 Durant lost control of General Motors. Officials of the company decided that the Frigidaire division should be merged with that of the Delco Farm Lighting division, which had an excess of plant capacity and personnel. The company was moved to Dayton, and most of the old personnel, including Mr. Replogle, left the company.

Retains Patent Rights

Mr. Replogle retained patent rights to the type of machine on which he had worked at Frigidaire, and with his associate Frank Wurl, attempted to get other parties interested in it. They finally sold Glen Cowan of the Arctic Dairy Co., Detroit, on the idea of trying out a mechanically refrigerated ice cream cabinet, and in 1921 started to make the cabinets in the Nizer laboratories.

The story of the Nizer Co. is covered quite completely in the article by W. G. von Meyer on page 20. Mr. Replogle's first Nizer machine followed the general principles of the design which he had developed at Frigidaire, with a considerable number of refinements, particularly in the matter of controls.

First cabinets made were of wood, and were self-contained. Later models were for remote installations, and all cabinets were of metal. Air-cooled models were then introduced, and shortly thereafter Mr. Replogle introduced a line of units for other commercial refrigeration applications.

The first of such models ever built is still in operation in Mr. Replogle's home, and has required very little servicing, he says, except on the motor. One of the service operations, it was determined from a greasy service ticket which we found on the machine, was done in 1926 by Al Knapp, now a well-known member of Kelvinator engineering staff.

Mr. Replogle left the company when it merged with Kelvinator and in 1930 joined Copeland Products, Inc., as chief engineer, at the request of Louis Ruthenburg, the president. He was with Copeland until 1933, when the firm was purchased by Dallas E. Winslow. Since that time he has been doing consulting work on engineering and patent matters for Frigidaire, Kelvinator, Norge, Universal Cooler, and others.

Working with Mr. Replogle were a number of men still active in the industry who must certainly be classed as pioneers, H. R. McPhail, now chief engineer of the Norge commercial refrigeration department, was with the Frigidaire engineering department when Mr. Replogle joined it in 1919. Ira Reindel, Norge director of engineering, worked in the research laboratories with Mr. Replogle. E. Heitman, Kelvinator chief engineer, was Replogle's assistant at Nizer. W. C. Rowles, Norge commercial sales manager, was factory superintendent for Frigidaire when they were operating at the plant on Scotten Ave. in Detroit.

Mr. Replogle believes that he was the first engineer in the small machine field to join the American Society of Refrigerating Engineers, and he relates that he was given pretty much of a "cold" reception at the first meetings which he attended.

Pioneer Engineer

JOHN R. REPLOGLE

Higham Started with Absopure; Then Went To Universal Cooler Where He Developed A Complete Line of Commercial Units

William Higham, chief engineer with Universal Cooler Corp., began his career in the refrigeration industry in 1925, after his graduation from Wayne University, Detroit. He was associated with Absopure Refrigerator Corp., working under Tom Pendergast, now commercial sales manager of Universal Cooler, who was at that time Absopure's plant manager in charge of all service.

While with Absopure, Mr. Higham was concerned with the development of evaporators, high sides, and ice cream cabinets. Harry C. Hayes was at that time chief engineer for the company.

In addition to the above work Mr. Higham, while with Absopure, also assisted in developing the company's line of commercial condensing units in sizes from ⅛ to 1½-hp., and did considerable experimental work with a 2-hp. unit.

He left Absopure in 1928 to join the engineering department of Universal Cooler Corp., as assistant to Harry Thompson, who was then chief engineer. In 1934, Mr. Higham was appointed chief engineer to succeed Mr. Thompson.

Starting with the ½-hp. condensing unit (Universal Cooler was making ¼ and ⅓-hp. units when he joined it), Mr. Higham carried the company's line of refrigerating machines up to its present range covering sizes up to 15 hp.

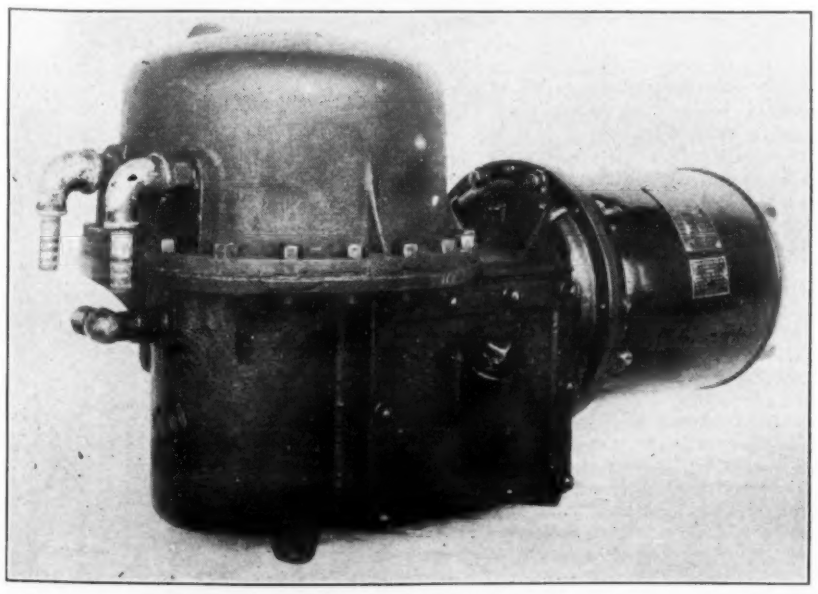
One of his most valuable contributions to the industry has been development of higher cabinet humidities and consequent small shrinkage of foods, first for commercial application and later in household models.

Universal Cooler's 1936 household line featured "double down-draft" cooling, a development which eliminated visible accumulation of frost on the cooler, effected surface of which was more than doubled.

A separate circulation was set up along two sides of the cooler, the heat being taken up by cooling plates with a temperature of 36° F. This was designed to prevent drying out of crisp foods like lettuce and onions, and leave other foods in as near a natural state as possible.

The down-draft cooling, another development which Mr. Higham sponsored, was designed to provide uniform temperatures as nearly as possible throughout the whole cabinet.

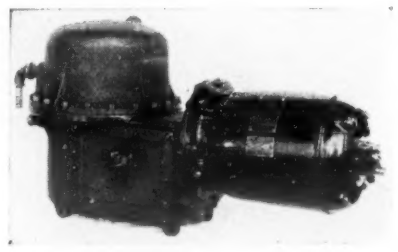
Frigidaire Household Unit—1919



This picture, furnished by the Wagner Electric Co., shows a Frigidaire unit built in February, 1919, of the type described in the article on John R. Replogle. It is powered by a ½-hp. repulsion start-induction run Wagner motor.

Wagner Electric Pioneered in Refrigerator Motor Design

Constant Improvement by Wagner Has Resulted in Motors That Are Second-To-None for Refrigeration



The first refrigeration unit equipped with Wagner motor—built in February, 1919.

In February, 1919 Wagner built, designed and applied its first motor to a household refrigeration unit—(See above photo)—a ¼-hp repulsion-start-induction motor. The motor used on this refrigeration unit was an adaptation of the standard Wagner repulsion-start-induction brush-lifting motor.

As the electric refrigeration industry progressed, this type of motor soon became practically the only type of motor used on electric refrigerators because of many desirable features, such as:

1. The repulsion-induction principle of motor design provided the necessary starting torque to overcome the high inertia in starting refrigerant compressors.
2. The brush-lifting feature of the repulsion-start-induction motors allowed so many economies in design that non-brush-lifting repulsion-induction motors could not compete very favorably. (Note: Capacitor motors were not commercially developed at that time.) Also, the brush-lifting repulsion-start-induction motors were much quieter and did not interfere with radio reception during their operating periods—an important consideration because of the parallel development of radio.
3. The sturdy and extra strong construction of frame, endplates, rotor and stator made the motor readily adaptable, for it could withstand the continuous and rough treatment early refrigerators received.

With the further progress of the electric refrigeration industry, Wagner, as a motor manufacturer, had to meet many new demands and problems. That these problems were satisfactorily solved is attested by the reliability, economy, and satisfactory performance of refrigeration motors of today. The three most important considerations that Wagner had to face were: (1) starting reliability, (2) oiling, and (3) noise. A brief history of each problem and how Wagner overcame them is interesting.

STARTING RELIABILITY. The fractional-horsepower motors of the War and pre-War days were not usually applied to appliances and machinery that operated intermittently. Hence, the design of these old motors merely provided sufficient starting characteristics to insure that the motor would get up to full speed. Further, the construction of the starting mechanism was very simple and of sufficient reliability to outlast the normal life of the motor.

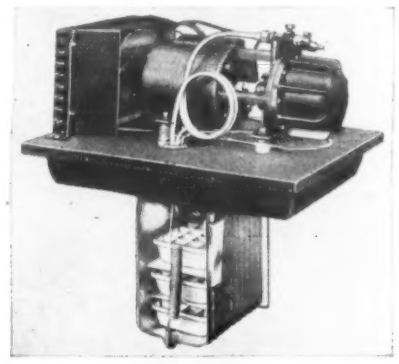
Wagner, by improving the design of the brushes, brush holders, commutator bars and segments, brush-lifting mechanism, etc., was able to considerably better the starting operation of the motor, including a large factor of safety in the life of the switching mechanism.

OILING. The Wagner motor applied on the refrigeration unit shown at the left was lubricated by the wool-pack method. This type of oiling worked all right for most applications where motors were properly oiled periodically. However, the average householder would neglect this important maintenance function, with the result that there were many failures. Wagner redesigned the lubrication system to a system with oil rings to lubricate the bearings and oil wells of sufficient size to hold a plentiful supply of oil. This proved to be inadequate, for in transit, there was much spilling of oil.

Finally, Wagner developed the wool-yarn lubrication system that is used today. A system that provides the bearings with sufficient lubricant so that only occasional oiling is necessary, and at the same time eliminating oil spilling.

NOISE. Since 1913, Wagner has built a special quiet line of large repulsion-start-induction motors for the blower and compressor industries. Hence, fifteen years ago, when the problem of noise first confronted the refrigeration industry, Wagner was well qualified to develop and produce quiet motors for refrigerator drives. Working closely, at all times, with the members of the refrigeration industry, Wagner in the early stages developed quiet motors that satisfactorily met public approval.

Some of the means and methods used by Wagner in the design of quiet-running motors are: (1) dynamic balancing of the rotors; (2) refinements in the electrical design and construction, such as skewing the slots, altering the air-gap, improving the slot dimensions and proportions, improving winding construction, etc.; (3) using resilient mountings; (4) eliminating end-play noise by using resilient thrust washers; (5) cushioning the switch parts with shock-absorbing material; (6) by accurately diamond-boring the bearings to insure correct clearances and alignment; and (7) selection of the proper brushes for torque and quietness during starting and stopping.



A modern refrigeration unit of today—equipped with Wagner motor.

Wagner realizes that the progress of the electric refrigeration industry has been immeasurably tied up with its progress. As the industry moves on, and brings new greater opportunities to those who move with it, Wagner, as in the past, is glad of any opportunity to be of even greater service to those associated with it.

Easy and clear explanations of the design features, construction details, ratings, operating characteristics, applications, etc. of Wagner refrigerator motors as well as other types of fractional-horsepower motors are contained in a valuable fifty-two page bulletin No. 177. It is available to all who are interested. Write to Wagner Electric Corporation, 6441 Plymouth Avenue, St. Louis, Mo.

MS 136-6M

1916 Report Discusses Market For and Development of Refrigerating Machines For Household Use

Editor's Note: This article, which was published in November, 1916, issue of *Ice and Refrigeration*—page 202, is reprinted here (with permission) as an interesting account of the infancy of household electric refrigerators—as seen through the eyes of an "ice man."

The advent of the household refrigerating machine that is to "put the ice man out of business" has been prophesied at frequent intervals during the entire twenty-five years since *Ice and Refrigeration* started on its career. But the ice man is still in evidence and was a very much sought for contributor to human needs during the past summer.

Small machines suitable for residence use have long been built by nearly all the principal ice machine builders, some of them automatically controlled and quite a number of these have been installed in homes. These machines, while adequate, are too expensive for the average family and probably require more attention than would be given them in the home.

The average fairly well to do family does not spend for ice more than $20 or $30 yearly and the household machine, to be acceptable, must compete with such figures. Moreover the price of the machine would need to be low enough to prove attractive and must prove to be durable as well as reliable.

The little inexpensive machine that needs little or no attention and that any one can operate, is still wanting. It must be conceded however that progress toward the production of such a machine has been made.

Hundreds of thousands of dollars have been expended by people who believed the Utopian article had been invented only to learn after sad experience that their confidence had been misplaced and that there is still something lacking in the much desired article.

As a matter of information regarding this yet little known work in the field of mechanical refrigeration, Ice and Refrigeration offers herewith a brief account of the principal inventions of household refrigerating machines that have been or are being introduced, although thus far apparently with quite indifferent success.

It will give some indication of how eagerly this seemingly and supposed-to-be highly remunerative chimera has been pursued.

The first machines of this nature devised were along the principle of the oldest type of refrigerating machinery, namely the vacuum machine.

Of these the "Raplin" made by the Pulsometer Engineering Co., England, and the "W-K" made by the Vacuum Ice Machine Co., Odenese, Denmark, are representative types. These are made for hand operation or machine drive by belt from any convenient source of power.

The refrigerating effect of these machines is based upon the well known principle that rapid evaporation of a portion of the liquid in the vessel cools the remainder. By producing a vacuum over the water, evaporation is so rapid that ice is formed in the vessel.

However, in order to maintain this vacuum and obtain continuous refrigerating effect the vapor from the water must be removed as fast as formed. For this purpose sulphuric acid is employed as an absorbent, owing to its well known affinity for water vapor.

The machine therefore, consists of a vacuum pump and sulphuric acid container and the necessary connections to the article to be cooled.

Only a very limited amount of refrigeration is available with these machines. Ordinary carafes, half full of water, may be cooled so that ice forms on top of the water in two or three minutes, and a circular piece of ice weighing one and a half pounds will be formed in about five minutes.

The sulphuric acid after each operation becomes weaker, that is, can absorb less moisture and hence diminishes the refrigerating effect of the machine until, when saturated, no more refrigeration can be produced and a fresh charge of acid must be substituted.

The little machines have been found useful in the tropics and here and there for special reasons, but are not practical for general use. They must be handled with great care on account of the destructive effect of sulphuric acid.

Compression Machines Introduced in Switzerland

Another European refrigerating machine intended for the household, using methyl chloride as the refrigerant, was introduced in Switzerland just before the outbreak of the great war in 1914. It is known as the "Autofrigor" and is manufactured by Esher Wyss & Company, Zurich, Switzerland.

The compressor is double-acting, the cylinders having an oscillating motion. The gas from the suction chamber is compressed into the lower pressure chamber. The riser conducts the gas to upper pressure chamber, and pipe to condenser.

The condenser is surrounded by a water jacket which can be easily removed for cleaning. The condensed liquefied gas presses through nozzle used in place of an expansion valve to the evaporator. The driving motor has its rotor, enclosed by a rigidly fixed armature and is separated from it by a steel liner, which also serves to enclose the pressure chamber.

The high pressure in this chamber, it is stated, may reach from one-sixth to six atmospheres, according to the temperature of the condenser water. Glycerine is used for lubrication, and is placed in the upper pressure chamber, whence it lubricates all parts of the compressor, collects in the lower pressure chamber, and is carried back by the pipe.

A small portion of the lubricant is atomized during operation and is carried through the nozzle into the evaporator and settles at the bottom in the container.

Many Small Absorption Units Produced Early

The next type of household refrigerating machine to be introduced was the small ammonia absorption apparatus.

Of these there are a considerable number, the principal ones being: The Auto-Vacuum Machine, The "Bosse," New York, N. Y., The "Acme," New York, N. Y., The "Zicer," Cleveland, Ohio, The "Penquin," Dubuque, Iowa, The "Willsie," Jacksonville, Fla., The "Germania," Belleville, Ill., The "McCurdy," Ft. Madison, Iowa.

More activity has been apparent in the invention of compression system machines for household use and these are represented by such types as the following:

Audiffren, France and America; "Domelre" (Isko), Detroit; Auto-Electric (Blizzard) Milwaukee; Bachman, Pittsburgh, Pa.; Brunswick Automatic, New Brunswick, N. J.; "Narco," Wapakoneta, Ohio; Girard, Springfield, Ill.; Harris, Portland, Ore.; Williams, Electric, Indianapolis, Ind.; Williams, New York.

McCrary, Jacksonville, Fla.; Standard, Belleville, Ill.; Barsmith, Chicago; McClellan, Chicago; Anderson, Chicago; Goosmann, Chicago; Hapgood (Montclair), New York, N. Y.; Frostmaker, Chicago; Guardian, Detroit; Cold Blast, (Air), Chicago; Cold Unit (Air), Chicago.

Auto-Vacuum Machines Introduced in 1912

The Auto-Vacuum machine is made in a number of styles and designs, practically all of them for operating on the intermittent principle; that is, the same vessel is used alternately as a gas generator and as gas absorber.

When heat is applied to the vessel in this type of machine the gas contained in the liquid, saturated with the refrigerant gas, is driven off.

The supply of heat is then removed and the weak liquor cooled by a flow of cold water. When the weak liquor has become cool the vessel acts as an absorber and reabsorbs the gas that was driven off by heat.

Introduced about 1912, a number of auto-vacuum companies were formed in this country and in Europe to exploit the vacuum absorption machine. Nearly all of these companies, however, appear to be still in the promotion stage.

'Zicer' Was Unique Absorption-Type System

Another machine of somewhat different type, known as the "Zicer" is manufactured in Cleveland, O. It has two tanks, the first acting alternately as generator and absorber, and the second, always submerged in water, serving as combined condensor and liquid receiver.

The evaporator is located in the refrigerator and consists of a galvanized iron brine tank and an expansion coil submerged in the brine. The absorber-generator and the condenser are connected by means of a short coil termed the rectifier. This machine is charged with distilled water and anhydrous ammonia, both placed in the generator, where they form strong aqua ammonia.

Gas jets underneath the generator serve to heat the contents driving the gas from the strong aqua through the rectifier into the condenser. The rectifier is provided with baffles which serve to condense the water vapor carried over with the ammonia gas, the water falling back into the generator.

By means of thermostats submerged in the generator-absorber the fuel gas supply is shut off automatically whenever the temperature reaches a pre-determined height, and at the same time the water, which is flowing into the condenser all the time, is made to flow down over the hot generator-absorber, cooling it.

As the liquid becomes cool it drops rapidly in pressure until it reaches the pressure it had before heat was applied. This decreased pressure opens an automatic valve which had been holding the liquefied ammonia in the condenser, allowing this liquid to flow downward into the expansion coils in the refrigerator.

The ammonia passes through a series of small openings, and as the pressure by this time has been removed by the cooling of the generator-absorber, the liquid readily expands into a gas in the evaporator coils, producing refrigeration.

The gas formed returns through the expansion coils to the absorber where it is taken up by the cool weak aqua, producing strong ammonia liquor. This action causes a further drop of the pressure in the condenser.

When this has reached a pre-determined point, automatic mechanism turns the fuel into the burner and stops the water from flowing over the absorber. The fuel gas is lit by a pilot light always left burning.

'Penquin' Used 200 Gallons Of Water Per Day

The "Penquin" machine is somewhat different in the arrangement of its interior parts. The generator-absorber is placed below and to the left of the condenser-receiver and evaporating coils. The rectifier is within the generator-absorber. The machine is furnished complete and fully charged with ammonia liquor and, it is claimed, needs no attention during operation.

The machine, it is stated, requires approximately 200 gallons of water in twenty-four hours, varying, of course, with the temperature of the water. The gas consumption for heating the generator is given as from 120 to 150 cubic feet per hundred pounds of refrigeration for twenty-four hours.

The machine is usually installed on top of the refrigerator for which purpose a hole six inches square is cut in the top of the ice chamber.

'Willsie' Absorption Unit Used Kerosene

The Willsie absorption machine was patented by H. E. Willsie, Crawford, N. J. In this type of generator-absorber, aqua ammonia at a strength of about 30° Beaume is heated with kerosene lamps which drive off the gas through pipes into the rectifier. Here water vapor is condensed and drains back through the pan to the generator.

The tank is filled with cooling water. In the pipes the ammonia gas is liquefied and drains into ammonia receiver from where it rises through a pipe to the evaporator where refrigeration is accomplished. The ammonia vapor now passes through pipes to the pan that contains the aqua drained from the pipe.

The pressure of the returning gas forces liquid up the pipe to where it overcomes the static pressure in the generator and the gas passes through a pipe into the generator and is absorbed by the weak liquor. It has not passed the promotion stage.

'Audiffren' Pioneered Domestic Compression Unit

One of the first of the household refrigerating machines of the compression type to be introduced is the "Audiffren," invented by the Abbe Audiffren, Grasse, France, and is one of the simplest or least complex of all the small refrigeration machines.

The refrigerant employed is SO_2. (For description see Ice and Refrigeration, February, 1908 and December, 1908). In 1912 the H. W. Johns-Manville Co. started to introduce this machine in America and for a time manufactured the machine at Fort Wayne. Later the work was taken over by the Audiffren Company of America.

The machine has not proved to be as desirable as its promoters anticipated.

Electrical Refrigerating Co. Used Rotary Unit in 1916

In October, 1916, the Electric Refrigerating Co., Woolworth Building, New York exhibited an electrically operated household refrigerating machine in that city.

They make it in two sizes, one equivalent to 150 pounds ice melting capacity with ¼-hp. motor, and one 300 pounds capacity with ½-hp. motor. A third size requiring one horsepower motor is to be brought out shortly.

The refrigerant used is ethyl chloride. The rotary compressor and motor may be mounted on top of the refrigerator with the evaporator within the ice chamber of the refrigerator, being dropped through a square cut hole in the top.

The amount of water required for the condenser is said to be about fifteen gallons per hour during operation of the machine. All valves are locked and no adjustment of same. it is claimed, will be necessary.

Automatic appliances shut off the power and water whenever a predetermined temperature is reached in the provision chamber. Provision is also made to prevent the pressure from rising about twenty-five pounds per square inch under any conditions.

Glycerine is used as the lubricant and no difficulty, it is asserted, is found by its getting into the condenser or expansion coils.

A refrigerating machine suitable for the modern home is manufactured by the Brunswick Refrigerating Co., New Brunswick, N. J. The ammonia compressor is ¼-ton refrigerating capacity per twenty-four hours, and there is a submerged condenser and automatic receiver.

The plant is controlled manually but the expansion valve is automatic in operation which regulates the back pressure. A brine tank within the refrigerator is provided with evaporating coils and is fitted for both cooling and ice making, there being two 10-pound ice cans in the tank.

The machine requires a 1-hp. electric motor, consuming about 0.5 to 0.6 kw. per hour. About twenty-five gallons of water per hour is required for the condenser. The machine is intended for operation from six to ten hours daily. The company furnishes refrigerator with refrigerating machine in one end, complete.

'Hapgood' Designed for Variety of Refrigerants

Another little compression machine, the invention of C. H. Hapgood, Boston, manufactured by the Montclair Refrigerating Co., is designed for such refrigerants as ethyl chloride, rhigolene, cynogene, etc. In the casing of this construction containing the lubricant (glycerine) is immersed a rotary pump. On the glycerine floats the liquid refrigerant (ethyl chloride). These two liquids are not miscible as the glycerine is much heavier then the ethyl chloride. On the top of the casing is secured a shell and tube condenser. The gas drawn from the expansion coil into the compressor is discharged through a pipe, together with such lubricant as has been drawn into the compressor along the bearings.

The discharged gas is then liquefied and gravitates to the main body of liquid refrigerant, while the discharged lubricant gravitates to the main body of lubricant in the casing.

The liquid refrigerant is taken off by pipe and passed through an automatic expansion valve and thus to expansion coil. The automatic expansion valve maintains a constant pressure in the expansion coil during the operation of the machine.

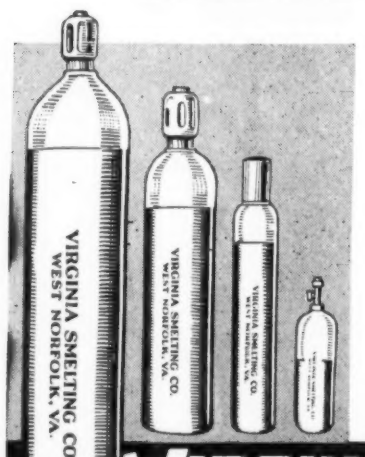
The power consumption is given as about 2.6 kw. hours per 100 pounds of refrigeration, while the water consumption is about 210 gallons. In an apparatus of 300 pounds daily refrigerating capacity, the charge of ethyl chloride is about sixty ounces and of glycerine about 120 ounces.

The machines may be hand operated or by an automatic temperature control.

The smallest size made of these machines has refrigerating capacity equal to the melting of about sixty pounds of ice daily. The medium size, which is about twelve inches high and eight inches in diameter of the round casing that encircles the machine, and about 120 pounds daily capacity when holding temperature in the refrigerator at about 40° F.

(*Concluded on Page 29, Column 1*)

Virginia Smelting Company began to serve the household refrigeration industry—then in its experimental stage.



On June 14, 1916, we shipped Extra Dry ESOTOO to the Western Electric Company for use in experiments being made in automatic refrigeration.

Today—wherever men enjoy the comforts of automatic refrigeration—Extra Dry ESOTOO (liquid sulphur dioxide) and V-METH-L (Virginia methyl chloride) are recognized as standards of high quality.

Located at a large shipping port, we solicit representation in foreign countries. Communicate with F. A. Eustis, Sec., Virginia Smelting Co., 131 State St., Boston, Mass.

VIRGINIA SMELTING CO.
WEST NORFOLK, VIRGINIA

McCord
Refrigeration and Air Conditioning
PRODUCTS

- CONDENSERS
- COMMERCIAL EVAPORATORS
- DOMESTIC EVAPORATORS
- COMFORT COOLERS
- MARKET COOLERS
- AIR CONDITIONING SURFACE
- UNIT HEATERS
- BLAST HEATING SURFACE
- CATALOGS ON REQUEST

McCORD RADIATOR & MFG. CO.
DETROIT, MICH.

Long List of Machines Is Evidence of Interest In Household Units in 1916

(*Concluded from Page 28, Column 5*)

'Narco' System Used 'Andrews Liquid'

The small compression machine, supplied under the name "Narco," is manufactured at Wapakoneta, Ohio. The refrigerant employed is known as "Andrews Liquid," from its discoverer, F. W. Andrews, Dayton, Ohio, a chemist and inventor.

The liquid is a compound, the ingredients being held a trade secret. The pressure of liquefaction is said to be forty pounds. The latent heat of vaporization 428 B.t.u. Its specific gravity is given as 1.20 and its boiling point as minus 44° F.

It is prepared by the manufacturers of the machine and is supplied at about the same price as anhydrous ammonia. The machine is made in capacities of from fifty pounds to two and half tons refrigeration per day of twenty-four hours.

The refrigerating machine does not differ materially from the ordinary compression machine. The compression pump and condenser are contained in one casing.

'Bachman' Employed Brine Tank Cooling

Another small compression machine is the invention of C. E. Bachman, Pittsburgh, Pa. and is manufactured in that city.

The machine is comprised of a compressor, condenser, oil separator and brine cooler. The latter may be of any design and may be placed within the refrigerator, or as a separate tank from which the cold brine circulates through the place it is desired to cool.

The interesting portion of this machine is the brine cooler made of coils in which the warm brine enters at the top and as chilled brine leaves at the bottom of the coils.

'Frostmaker' Had Neither Pistons Nor Valves

A radically different type of compression machine is the one introduced as the "Frostmaker," built in Chicago. The compressor has neither piston nor valve. Instead the gas, either sulphur dioxide or ammonia, is compressed by means of two rotating gears that intermesh. They are quite similar to those used in the old Quimby pumps.

The rotating gears with perfect alignment are said to be practically indestructable, as they are always submerged in oil when in operation, and these are the only moving parts of the machine.

The smallest size machine made requires a ¼-hp. motor for power and its refrigerating effect, with SO_2, is equal to the melting of 150 pounds of ice daily.

Its weight is about 200 pounds. It requires about twenty to thirty gallons of water per hour with water at 70° F. and about two kilowatts of electric energy for operating day of six hours.

'Isko' Used Wolf's Air-Cooled Condenser

"Isko" is the name applied to a small refrigerating machine manufactured in Detroit and sold in various sections of the United States. It is the same as the "Domelre," the invention of Fred W. Wolf, Jr., Chicago. (Descriptions and illustrations may be found in Ice and Refrigeration for April, 1914).

Sulphur dioxide is used for the refrigerant. The machine is placed on top of the refrigerator with expansion coils, valve and thermostat for automatic control within the box. The tin covered copper condenser coil forms a web about the compressor and motor.

The machine is made in two sizes, one of 200 pounds and one of 400 pounds refrigerating capacity. The smaller machine occupies a space 33x19½x22½ inches, and weighs about 230 pounds. The electric current for the ¼-hp. motor used to drive the smaller machine is said to be only 170 watts per hour.

No water is required as the condenser is air cooled. Apparently an attractive outfit for the home, it has not proved in all cases as successful as anticipated.

'Girard' Manufactured In Milwaukee

The Girard apparatus is a small compression machine, the invention of A. O. Girard, Milwaukee, Wis. It is operated by means of an electric motor or other power.

It consists essentially of a pump or compressor with piston, crank case, water jacket, condenser coil, return gas line, suction valve, discharge valve and oil separator.

A small bypass in the crank case serves not only for the removal of any ammonia that might find its way into the case, but also to admit a small quantity of oil into low pressure conduit, drawn by the suction of the piston, for lubrication of said piston.

This oil is eventually removed in the oil separator and returned to crank case. Thermostatic control apparatus is provided.

Another small compression machine, the "McClellan," manufactured at Chicago, is being exploited. It does not differ materially from the standard types of compression machinery with thermostatic control of power and water supply for condenser.

Unique Brine System Used in 'Barsmith'

"The "Barsmith" machine is the invention of H. J. Smith, while Dr. C. H. Barr is the one who prepared the refrigerant, which is said to be a combination of three ingredients.

Their present machine is said to be of 157 pounds of ice melting capacity per twenty-four hours. This is with a speed of thirty-six revolutions per minute.

They use a 70-pound enclosed brine tank and the refrigerant is injected into the brine direct, where it evaporates and is drawn from the surface by the suction of the compressor. The principle otherwise is identical with that of the ordinary compression machine.

One or two per cent of the refrigerant is said to saturate the brine used and after that no more refrigerant is absorbed by the brine.

The refrigerant vaporizes at atmospheric pressure at 44° F. While under fifteen inches of vacuum with the refrigerant injected into the bottom of the brine tank, the minimum temperature of 15° F. is obtainable.

They aim to maintain a temperature of fifty degrees in the refrigerator. The machine operates against a high pressure of about eight pounds.

'Blizzard' Installed Either Remote or Self-Contained

Another small machine is that known as the "Blizzard," manufactured in Milwaukee, Wis. This small household machine is 500 lbs. refrigerating capacity and is operated under automatic control.

It is of the general compression system design, compressor driven by ½-hp. electric motor. It may be placed either on top the refrigerator or alongside of it or in the basement.

'Harris' Walk-in Cooler Unit Was Submerged in Water

A small machine intended for residence use or small stores is manufactured by the Harris Ice Machine Works, Portland, Ore.

The machine is of ½-ton capacity, the compressor requiring a 1-ton motor, and operating at about sixty r.p.m. No attention is required after starting the machine, it is stated. It will cool a box 6x8x8 feet to 32° F., with machine running about ten hours out of the twenty-four.

The compressor is described as the inverted trunk type with double-end piston fitted with suction valve, discharging the gas into a spiral coil fitted inside of a cast iron cylindrical body.

The entire compressor and condenser is submerged in a body of water. This not only produces a good cooling effect but muffles the sound of the operation of the machine.

A. P. Anderson Devised Enclosed Machine

Another recent invention of a small household machine was designed by A. P. Anderson of Chicago, refrigerating engineer. He uses ammonia as the refrigerant.

Its distinctive feature is that it is all enclosed in one casting and the entire machine, including motor, may be placed within the refrigerator. The 2-cylinder compressor, condenser and receiver are entirely surrounded by water.

The oil seal is placed around the shaft and packing to prevent leakage of ammonia. The small size, equivalent to 175 pounds ice melting daily, has a ¼-hp. motor. The machines are automatically controlled from a thermostat which controls the operation of switch and a water valve.

On a test run the machine placed in an ordinary refrigerator of thirty-one cubic feet capacity readily maintained a temperature of 36° to 40° F., running about ten minutes out of each hour. Current consumption for motor was 250 watts per hour and water consumption 4.75 gallons per hour.

Cooling water was 60° F. Room temperature, 85° F.

Air and Carbon Dioxide Used in Early Machines

A small machine invented by J. C. Goosmann, Chicago, using CO_2 as the refrigerant, has recently been perfected. It is provided with automatic pressure control in the condenser as well as in the evaporator.

The smallest size will be equivalent to 200 pounds refrigerating capacity and may be placed upon or alongside the refrigerator. A cylinder bore of ⅞-inch and a stroke of three inches produces 300 pounds of ice melting effect when operating at 300 r.p.m., with a ½-hp. motor and with condenser water not over 75° F.

The pressure control is accomplished by means of an automatic expansion valve and an automatic gas replenishing valve. By means of these devices, it is claimed, constant non-fluctuating temperatures can be maintained.

Among the recent projected household ice machines are two rather unique apparatuses. One is a cold air refrigerating machine introduced by a Chicago inventor and known as the "Cold Blast" machine.

As its name implies it is a machine using air as the refrigerant and consists of multiple compressors which condense the air under a pressure of forty pounds into a special cooler where it is cooled with water and then expanded into the cooling chamber of the refrigerator.

Its success as a refrigerating machine is problematical.

A new air machine, the "Cold Unit" invented by W. H. Cotton of Chicago, is being tried out. It consists of a small compressor running at 1100 strokes per minute, driven by a small electric motor, both mounted on top the refrigerator.

The compressor drives air into four connected tubes placed against the side of the refrigerator. These tubes or cylinders are of steel and are about four feet long and three inches in diameter.

Air is forced into these tubes until a pressure of from 600 to 900 pounds is obtained. The power is automatically shut off at any predetermined pressure.

The heat of the compression is allowed to radiate into the atmosphere and when this is accomplished the refrigerating effect begins by opening of an automatically controlled expansion valve within the refrigerator.

The air is cooled in expanding and chills the refrigerator. Temperatures of zero or below can thus be produced, it is claimed. The expansion pipe is connected to the fourth cylinder. When evaporated the air returns to the atmosphere.

Another proposed device is intended for utilizing the refrigerating effect of liquid carbon dioxide, such as is used for carbonating and in soda fountains.

The CO_2 drum is placed in an insulating casing within which is what is equivalent to the return or suction coil. The CO_2 is expanded through a needle valve into the cooling coils of the refrigerator, and the returning warm gas, after serving to warm the cylinder and facilitate the discharge of the CO_2 is exhausted into the sewer.

When the drum is empty it is replaced with a fresh drum. Its economy would not be attractive even if its operation were satisfactory.

Other Machines Of Various Types

Small machines supposed to be suitable for the household have been invented and are being exploited by a number of other parties.

Among them are an engineering firm in Toledo; G. D. Warriner, New Orleans; the "Simplex," made in Belleville, Ill.; the "McCrary" machine made in both Jacksonville, Fla. and in Houston, Texas; the "Wright," invented by Edgar Wright, Brookfield, Mass.

The "Guardian" promoted in Detroit; the "Hercules Electric," a small machine operated with CO_2 as a refrigerant, but apparently in the promotion stage, as is a small machine invented by James Gillespie, Youngstown, Ohio, a little compressor apparatus just being introduced.

A small ammonia compression machine was invented a couple of years ago by J. A. Ulmer, Poterville, Cal., and a few of them built. Another machine from the same state using "rhigolene" as the refrigerant was announced in Ice and Refrigeration in August 1916.

A small machine for which it is claimed a new principle recently developed is to be utilized, but which apparently is a modification of the ammonia absorption system, is reported from Newark, N. J., and another utilizing the ammonia absorption system from Madison, Iowa.

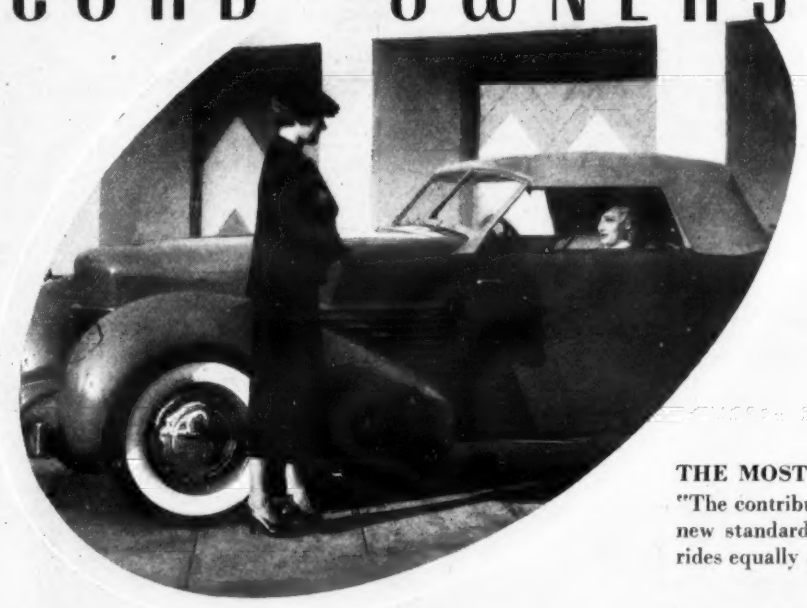
The above gives some idea of the great activity in the endeavor to obtain an easy and inexpensive means for cooling the household refrigerator. Many of these inventions are unlikely to go farther than the promotion stage and some apparently intended mainly for the sale of territory to agents.

While someone may eventually work out the problem to a successful issue it cannot be said that anyone has done so as yet or has given any substantial basis for the expectation that it will be done in the near future.

From the most reliable sources of information of *Ice and Refrigeration* none of the small machines referred to in this article can as yet be termed successful.

Most of them have already demonstrated their inefficiency from a practical standpoint.

CORD OWNERS SAY:



THE MOST COMFORTABLE CAR

"The contribution of low unsprung weight results in a new standard of comfort. The rear seat of the Cord rides equally as well as the front."

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"A demonstration on ice covered highways last February sold me on the Cord, and subsequent experience on wet, slippery roads convinced me of the value of the Front-Wheel Drive principle from a safety standpoint."

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Dallas, Texas.

Quality IN EVERY DETAIL

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AUBURN AUTOMOBILE CO. . . AUBURN, INDIANA

17,726 Commercial Condensing Units Are Shipped to Distributors by 15 Companies in August, 1936

The following report of commercial refrigerating and air-conditioning equipment sales for August, 1936, were made to the Commercial Refrigeration Section of the Refrigeration Division of the National Electrical Manufacturers Association (Nema by the following 15 companies:

Brunner Manufacturing Co., Carrier Engineering Corp., Crosley Radio Corp., Frigidaire Corp., General Electric Co., Gibson Electric Refrigeration Corp., Kelvinator Corp., Leonard Refrigerator Co., Merchant & Evans Co., Norge Corp., Servel, Inc., Uniflow Manufacturing Co., Universal Cooler Corp., Westinghouse Electric & Manufacturing Co., and York Ice Machinery Corp.

	SALES FOR AUGUST, 1936							
	Domestic		Canadian		Other Foreign		Total World	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Bottle Water Coolers—Complete	421	$ 31,694	4	$ 356	26	$ 2,234	451	$ 34,284
2. Pressure Water Coolers—Complete	1,615	171,964	9	868	113	12,409	1,737	185,241
3. Water Coolers—Low Side Only	125	8,456	.....	.....	8	417	133	8,873
4. Ice Cream Cabinets—Complete	953	133,145	11	1,101	265	25,274	1,229	159,520
5. Ice Cream Holding Cab. Only (Remote)	307	42,927	9	1,110	25	2,666	341	46,703
6. Bottled Beverage Coolers—Complete	2,290	162,972	45	3,111	86	5,940	2,421	172,023
7. Milk Cooling Cabinets (No High Sides)	441	30,742	.....	.....	69	3,072	510	33,814
8. Air Conditioners—Self-Contained	342	67,335	.....	.....	25	5,505	367	72,840
9. Air Conditioners—Floor Type (No High Sides)	358	92,116	1	150	18	5,281	377	97,547
10. Air Conditioners—Ceiling (Cooling Only—No High Sides)	155	29,151	2	333	21	4,351	178	33,835
11. Air Conditioners—Ceiling Type (Equipped for Heating—No High Sides)	36	20,996	1	1,022	1	640	38	22,658
12. Air Conditioners—Residential Type (No High Sides, Boilers, or Furnaces)	8	3,988	.....	.....	.....	.....	8	3,988
13. Condensing Units Less Than ⅓ Hp.	2,261	107,900	26	1,661	824	50,391	3,111	159,952
14. Condensing Units —⅓ Hp.	2,112	155,832	28	2,394	426	34,293	2,556	192,519
15. Condensing Units—½ Hp.	1,807	174,988	34	3,391	461	48,889	2,302	227,268
16. Condensing Units—¾ Hp.	1,180	144,191	20	2,765	188	24,964	1,388	171,920
17. Condensing Units—1 Hp.	778	116,790	7	1,272	104	16,659	889	134,721
18. Condensing Units—1½ Hp.	436	84,330	4	888	55	10,138	495	95,356
19. Condensing Units—2 Hp.	168	37,856	4	735	37	7,951	209	46,542
20. Condensing Units—3 Hp.	182	51,429	2	600	13	3,628	197	55,657
21. Condensing Units—5 Hp.	102	48,424	2	632	18	7,698	122	56,754
22. Condensing Units—7½ Hp.	60	34,895	.....	.....	6	3,277	66	38,172
23. Condensing Units—10 Hp.	56	41,799	.....	77*	3	2,085	59	43,807
24. Condensing Units—15 Hp.	59	55,229	1	390	2	1,773	62	57,392
25. Condensing Units—20 Hp.	29	34,728	.....	.....	2	2,036	31	36,764
26. Condensing Units—25 Hp.	23	31,557	....	.....	1	1,200	24	32,757
27. Total Lines 13 to 26 Inclusive	**9,253**	.....	**128**	.....	**2,140**	.....	**11,521**	.....
28. Total Lines 1, 2, 4, 6, 8, and 27	**14,874**	.....	**197**	.....	**2,655**	.....	**17,726**	.....
29. Commercial Evaporators (Not Reported Above)	4,775	124,466	145	5,680	1,359	35,310	6,279	165,456
30. Air-Conditioning Evaporators (Not Reported Above)	339	25,514	.....	.....	9	3,233	348	28,747
31. Total Commercial & Air Conditioning	.....	**$2,065,414**	.....	**$28,362**	.....	**$321,314**	.....	**$2,415,110**

*To be subtracted from total.

109,656 Household Electric Refrigerators Sold by 15 Companies in August

The following 15 member companies of the Refrigeration Division of the National Electrical Manufacturers Association (Nema) reported household refrigerator sales for August, 1936: Apex Electrical Mfg. Co., Crosley Radio Corp., Fairbanks, Morse & Co., Frigidaire Corp., General Electric Co., Gibson Electric Refrigeration Co., Kelvinator Corp., Leonard Refrigerator Co., Norge Corp., Servel, Inc. (export only), Stewart-Warner Corp., Sunbeam Electric Mfg. Co., Uniflow Mfg. Co., Universal Cooler Corp., and Westinghouse Electric & Mfg. Co. Member companies not reporting included: Jomoco, Inc., Merchant & Evans Co., and Sparks-Withington Co.

The sales of the reporting companies do, however, include units manufactured for the following concerns: Major Appliance Corp., Montgomery Ward & Co., Potter Refrigerator Corp., and Sears, Roebuck & Co.

	SALES FOR AUGUST, 1936					
	Domestic		Canadian		Other Foreign	
Lacquer (Exterior) Cabinets Complete	Quantity	Value	Quantity	Value	Quantity	Value
1. Chest	1,119	$ 51,505	13	$ 632	13*	$ 633
2. Less than 3 cu. ft.	713	38,065	.....	.....	11	693
3. 3 to 3.99 cu. ft.	3.766	218,642	100	5,733	1,170	67,585
4. 4 to 4.99 cu. ft.	14,665	963,493	522	35,227	4,214	282,877
5. 5 to 5.99 cu. ft.	19,252	1,464,996	360	29,469	2,057*	161,371
6. 6 to 6.99 cu. ft.	32,582	2,529,319	102	8,907	1,027	90,823
7. 7 to 7.99 cu. ft.	5,520	575,159	141	16,207	539	56,897
8. 8 to 9.99 cu. ft.	1,163	113,831	.....	.....	58	6,370
9. 10 to 12.99 cu. ft.	15	3,879	.....	.....	30	3,705
10. 13 cu. ft. and up	5	902	.....	.....	6	1,124
11. Total Lacquer	**78,800**	**5,959,791**	**1,238**	**96,175**	**9,125**	**672,078**
Porcelain (Exterior) Cabinets Complete						
12. Up to 4.99 cu. ft.	497	37,148	3	225	101	7,592
13. 5 to 5.99 cu. ft.	2,163	185,153*	29	2,613	255	21,906
14. 6 to 6.99 cu. ft.	4,351	407,429	5	491	178	17,314
15. 7 to 7.99 cu. ft.	2,883	323,570	1*	119	218	25,806
16. 8 to 9.99 cu. ft.	2,262	288,783	6	722	158	21,171
17. 10 to 12.99 cu. ft.	313	54,469	3	534	79	12,895
18. 13 cu. ft. and up	289	67,319	4	1,142	55	13,710
19. Total Porcelain	**12,758**	**1,363,871**	**51**	**5,846**	**1,044**	**120,394**
20. Total—Lines 11 and 19	**91,558**	**7,323,662**	**1,289**	**102,021**	**10,169**	**792,472**
21. Separate Systems ¼ Hp or Less	5,482	194,464	.....	.....	598	33,436
22. Separate Household Evaporators	307	5,586	73	1,528	180	3,767
23. Total—Lines 20, 21, 22	**97,347**	.....	**1,362**	.....	**10,947**	.....
24. Condensing Units ¼ Hp. or Less	525	28,852	15	923	309	17,851
25. Cabinets—No Systems	495	12,961	.....	.....	375	11,890
26. Total Household	.....	**$7,565,525**	.....	**$104,472**	.....	**$859,416**

*Includes sales and credits by more than one company.

New York & California Lead Refrigerator Sales in August

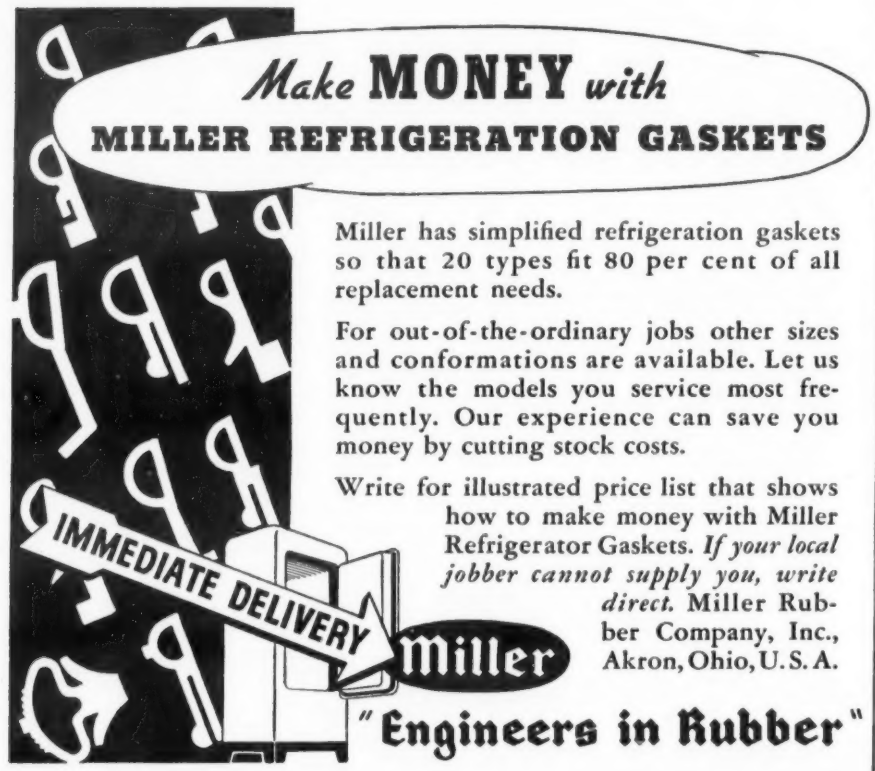
States and Territories	Quantity of Household Low Sides
Alabama	781
Arizona	112
Arkansas	203
California	12,968
Colorado	554
Connecticut	1,684
Delaware	247
District of Columbia	677
Florida	2,547
Georgia	786
Idaho	87
Illinois	4,757
Indiana	2,275
Iowa	647
Kansas	512
Kentucky	1,385
Louisiana	323
Maine	259
Maryland	1,174
Massachusetts	4,109
Michigan	4,873
Minnesota	1,027
Mississippi	953
Missouri	2,864
Montana	434
Nebraska	494
Nevada	192
New Hampshire	73
New Jersey	4,207
New Mexico	127
New York	16,772
North Carolina	1,274
North Dakota	49
Ohio	5,680
Oklahoma	493
Oregon	554
Pennsylvania	7,980
Rhode Island	678
South Carolina	1,074
South Dakota	121
Tennessee	1,057
Texas	4,224
Utah	273
Vermont	197
Virginia	1,512
Washington	1,947
West Virginia	225
Wisconsin	1,362
Wyoming	44
Total United States	**97,347**
Canada	1,362
Other Foreign (Including U. S. Possessions)	10,947
Total for World	**109,656**

This summary includes adjustment figures reported by several companies which do not represent their actual August sales but are corrections to be applied to their first seven months' totals to give their correct total apportionment among the various states for eight months.

Exports of Electric Refrigerators

June, 1936, Shipments Reported by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

	Electric Household Refrigerators		Electric Commercial Refrigerators Up to 1 Ton		Parts for Electric Refrigerators
	Number	Value	Number	Value	Value
Austria	49	$ 3,562	18	$ 1,195	$ 513
Azores & Madeira Islands	2	300	...	...	...
Belgium	166	10,967	155	12,452	9,980
Bulgaria	1	103	...	...	...
Czechoslovakia	15	1,161	23	1,776	5,587
Denmark	...	...	...	...	2,397
Finland	35	3,200	10	930	3,037
France	1,129	78,018	56	4,487	43,470
Germany	3	471	...	...	...
Gibraltar	4	378	...	...	165
Greece	12	1,265	39	4,826	91
Irish Free State	124	11,416	...	...	139
Italy	115	7,616	...	...	2,398
Malta, Gozo & Cyprus	1	89	...	...	14
Netherlands	262	18,023	152	13,974	7,331
Norway	159	11,915	9	1,531	6,482
Poland & Danzig	6	389	1	101	49
Portugal	78	6,932	2	231	212
Rumania	17	1,364	...	...	592
U.S.S.R. (Russia)	11	1,245	...	...	16,976
Spain	252	19,698	120	11,597	6,106
Sweden	548	37,063	53	5,160	16,455
Switzerland	11	1,046	...	...	2,021
Albania	2	159	...	...	...
United Kingdom	4,194	261,451	634	54,054	137,479
Yugoslavia	5	318	...	...	63
Canada	1,798	98,155	274	16,407	113,549
Costa Rica	12	967	...	...	13
Guatemala	14	1,161	1	113	85
Honduras	17	1,021	2	313	248
Nicaragua	10	829	...	...	25
Panama	94	11,889	7	1,348	3,000
Salvador	19	1,914	1	527	86
Mexico	502	43,356	37	4,207	4,063
Newfoundland & Labrador	23	2,254	2	313	44
Bermuda	47	4,447	7	1,453	717
Barbados	6	549	...	...	600
Jamaica	11	1,203	...	...	49
Trinidad & Tobago	31	2,805	1	135	426
Other British West Indies	16	1,208	2	124	781
Cuba	543	48,935	61	7,658	12,211
Dominican Republic	31	2,839	2	403	313
Netherlands West Indies	131	16,054	10	895	1,102
French West Indies	4	307	2	269	36
Haiti, Republic of	1	64	...	...	3,941
Argentina	145	10,179	...	...	15,693
Bolivia	6	625	...	...	...
Brazil	946	84,787	148	14,408	6,721
Chile	8	673	...	...	9
Colombia	221	18,139	28	2,718	1,004
Ecuador	19	1,748	2	654	55
British Guiana	...	...	...	...	42
Surinam	5	416	...	...	...
Peru	1	209	7	702	500
Uruguay	196	11,707	28	1,687	4,090
Venezuela	218	17,891	9	1,696	584
Aden	8	1,015	...	...	148
British India	369	28,687	45	5,633	8,159
British Malaya	222	16,904	19	2,834	1,777
Ceylon	5	390	...	...	450
China	157	13,647	11	726	1,401
Netherlands India	86	8,865	34	5,743	5,208
French Indo-China	...	...	2	543	221
Hong Kong	34	3,593	1	82	124
Iraq	27	2,564	1	125	191
Japan	50	6,900	29	3,055	1,512
Kwantung	10	916	...	...	...
Palestine	87	7,373	51	5,704	3,364
Philippine Islands	241	25,333	17	3,333	1,239
Siam	47	2,525	...	...	...
Syria	50	4,771	3	263	999
Turkey	173	16,492	67	7,949	731
Australia	1,466	100,339	17	722	39,228
British Oceania	1	88	...	...	34
New Zealand	31	1,588	15	1,258	4,512
Belgian Congo	17	1,208	1	66	363
British East Africa	26	2,428	1	69	97
Union of South Africa	426	43,642	15	2,004	16,612
Other British South Africa	24	2,304	...	...	12
Gold Coast	...	...	3	198	733
Nigeria	17	1,496	...	...	153
Other British West Africa	2	159	...	...	2
Egypt	64	5,596	5	473	1,086
Algeria	252	19,600	27	2,089	529
Tunisia	147	11,225	34	3,196	...
Madagascar	33	2,567	...	...	1,495
Other French Africa	56	4,334	1	123	627
Morocco	96	6,712	3	484	996
Mozambique	9	1,027	...	...	90
Other Portuguese Africa	...	...	...	...	25
Canary Islands	24	2,268	...	...	...
Other Spanish Africa	29	2,346	...	...	...
Total	**16,562**	**$1,213,382**	**2,305**	**$215,016**	**$523,662**
Shipments to Hawaii	569	57,481	32	3,843	6,087
Puerto Rico	445	47,347	20	3,139	2,946
Virgin Islands	6	633	...	...	...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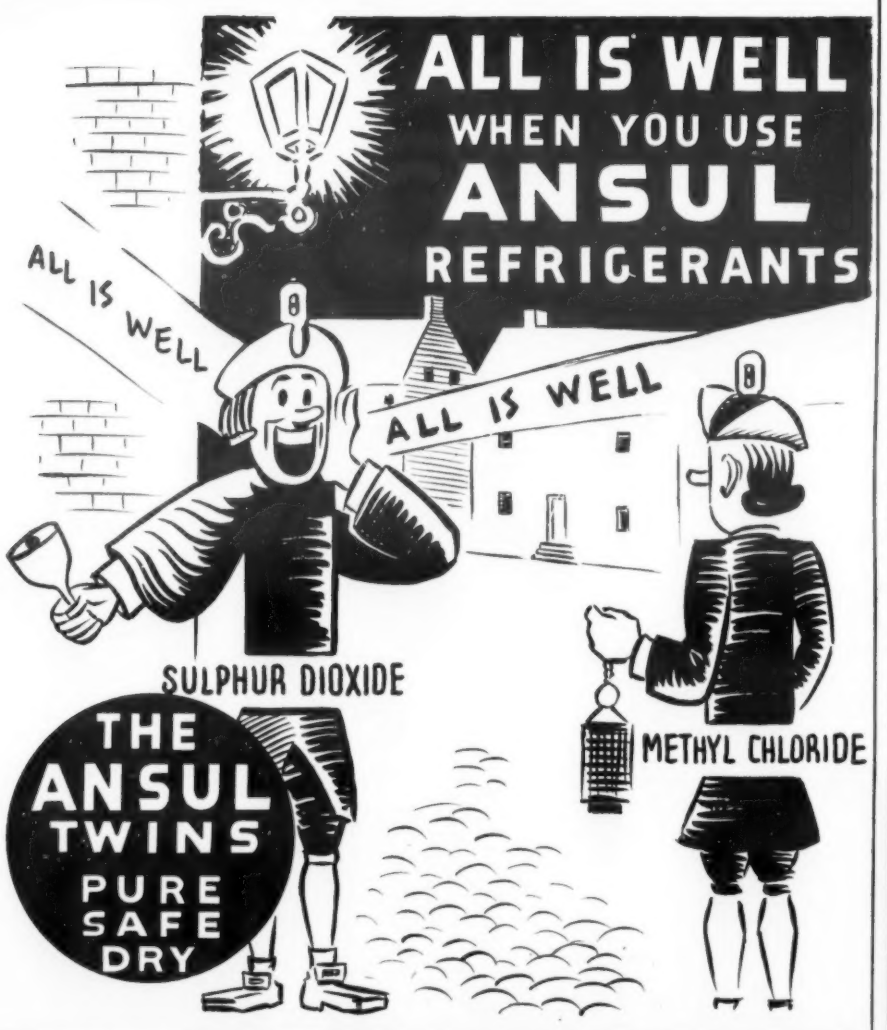

Nichols' and Jones' Report Started Utilities Considering Domestic Refrigeration As Load Builder in 1922

By Winifred Hughes

NEW YORK CITY—Early domestic electric refrigerators, with their attendant servicing needs and short-life propensities, awakened only a faint, yawning interest in the minds of utility executives in 1921 and 1922.

Possibilities for using domestic boxes as a stepping stone to increased current loads weren't too exciting. But even so, there were some in the utility kingdom who saw in the queer looking, noisy, and moody machines sources of great future revenue.

Because of their interest, it was decided to call the refrigerators to the attention of the utilities as load-building possibilities. The first recorded evidence of this was in a paper on "Domestic Refrigeration," which C. K. Nichols of the New York Edison Co. read before the Sales Managers' Convention at Association Island, Henderson Harbor, N. Y., in July, 1922.

Mr. Nichols paper was received with interest. It was followed by a report given by T. I. Jones, then general sales agent of the Brooklyn Edison Co., Inc., and was read at the 38th annual meeting of the Edison Illuminating Co.'s in 1922.

Discussed Refrigeration Principles

Mr. Jones' paper first took up the principles of refrigeration including sections on the refrigerants commonly used in mechanical refrigerators. The refrigerants were: ammonia, carbon dioxide, ethyl chloride, methyl chloride, and sulphur dioxide. He explained the refrigerant boiling points and pressure required in the process.

Detailed explanations of the cycle of operation employed in a mechanical box, the compression system, and absorption system (using brine system to accomplish refrigeration) were set up.

Brief mention of the tough job of marketing the electrically driven refrigerator, was followed by a section on servicing, which Mr. Jones introduced in this manner:

Questionnaire Sent to Owners

"With a view of correctly ascertaining the practical operation of modern household electric refrigerators, as recently developed, the complete lists of sales on two of the principle types of machines, within a given territory, were obtained from manufacturers, and from these lists, names were arbitrarily picked and a letter sent asking answers to the following questions:

What is the name of your refrigerator?

How long have you used it?

Has it operated successfully?

What troubles have you experienced, if any?

Mr. Jones summarized the 115 replies to the questionnaires thus:

1. Average time in use—one year and seven months.
2. Number operating generally satisfactorily—95.
3. Number with minor troubles—12.
4. Number generally unsatisfactory—4.
5. Number entirely discontinued—4.

Nature of Troubles

"Some who had minor troubles have had their machines in use two or three years," Mr. Jones' report continues. "Manufacturers state that material improvement has been made in the machines during the past year, and an analysis of replies of those using machines bought within the last 12 months seems to show general satisfaction with operation."

From this, Mr. Jones concluded that the household refrigerator has been sufficiently developed to warrant practical use with reasonable care of the machine. "It cannot operate without maintenance, and care is essential if the electric household refrigerator is to be in constant use," Mr. Jones commented.

The next feature presented in his paper was a table showing the comparative annual costs of operating electric household refrigerators. See Table 1.

Compares Types of Refrigeration

Taking the comparison of ice versus mechanical refrigeration as his next tenent, Mr. Jones lists the following:

Advantages

1. Better sanitary conditions.
2. Dry cold.
3. Pure ice for drinking purposes.
4. Quantities of food can be stored.
5. Economy in less food spoilage.
6. Convenience.
7. Savings in labor.
8. Does away with ice man.
9. No uncertain time of ice delivery.

Disadvantages

1. Present high cost of original equipment.
2. Uncertain servicing.

Referring to a study made by A. M. Greene, Jr., professor of mechanical engineering at Rensselaer Polytechnic Institute, Troy, N. Y., Mr. Jones said:

"Harmful bacteria become inactive when the temperature is less than 44° F. dry air. Temperature in the average domestic box does not usually drop below 50° F. so bacteria are still active and food spoils."

Professor Greene's test made on 250 domestic ice boxes showed that only 14% operated with temperatures of less than 45° F. "This demonstrates," says the professor, "that ice is not a reliable means of preserving food."

"That this has long been recognized is shown by development of the present system of cold storage warehouses using refrigerating machines which remove heat and produce dry temperature wherein bacteria are rendered dormant and foodstuffs kept and maintained in edible condition for indefinite periods."

Comparative Costs

Recalling Table 1 before mentioned. Mr. Jones explained that it showed that for an apparatus of 6-cu. ft. capacity, the annual cost of ice refrigeration is $58, as compared with cost for electric operation with a kwh. rate of five cents varying between $82 and $118.

The comparative analysis sets ice costs at 60 cents a cwt. and takes into consideration the interest on the investment and depreciation costs in both cases.

For a 10-cu. ft. refrigerator, comparison is $78 for ice, as against the variation of $99 to $139 for electric operation.

"Considering the saving in food and greater sanitary and convenience advantages of electric operation, this operating expense is by no means prohibitive," said Mr. Jones. He then stated that the difficulty is not so much in operating costs, as in large initial investment for electric refrigeration, and added that before this appliance can come into general use, the first cost must be materially reduced. "With quantity production, this difference will tend to disappear," he said.

Shows What Cost Would Be

He next presented a graph showing costs that electric refrigerators must be sold for, and the rate per kwh. under which they must operate to equal cost of ice refrigeration.

This graph, he explained, showed that a 6-cu. ft. box should sell for $175 and operate at a cost of five cents per kwh. to equal costs using a 6-cu. ft. ice box. Price for the 10-cu. ft. job was $269.

Mr. Jones told the association that at a conference with executives of refrigerating manufacturing companies held the previous month, an interest on the part of the manufacturers was shown, and evidences of an agreement on their part to reduce rates of refrigerators if output could be materially increased.

Turning to the practical side of the question: what's in it for the utilities, Mr. Jones brought up a comparison of the revenue derived from household electric appliances, according to the kwh.'s used, based on a record of actual use. If a special rate of five cents per kwh., which had been suggested from some sources, were made for the refrigeration business, this would reduce revenue figures in before mentioned graph from $64 to $40, he estimated.

Attractive Points to Utilities

Mr. Jones' conclusions from the report indicated the desirability of making serious attempts to develop the business and cited the following:

1. That no special additional investments are required to be in readiness to serve this type of apparatus as is the case with ranges.

2. That the average maximum demand for household refrigeration not being much more than ¼ of a kwh. and the number of kwh.'s used being comparatively large, the load factor of this business in comparison to other household service is exceptionally high and attractive.

From his summary of the situation, Mr. Jones next mentioned the main objection from the utility standpoint: that the power companies already had the greater portion of ice manufacturers' business, and that to encourage the sale of current for household electric refrigeration will be merely transferring the income from one customer to another.

Revenue Would Be Higher

His next point was that while it is true that the greater bulk of artificial ice manufacturing was being done by central station power, still, the average rate to central station service (usually high tension) did not at the time exceed 1¾ cents per kwh.

The estimated revenue for refrigeration service (low tension) as shown in Table 1 is 5 cents per kwh. a material margin in favor of low tension service.

"It is further pointed out that with electric refrigeration, use will be much more extensive than with local use of refrigeration by ice," Mr. Jones added.

Concluding his speech, Mr. Jones recommended, first: that central stations encourage the sale of electric refrigerators as at present developed, it being understood that the manufacturers guarantee proper service conditions.

Second: that the association appoint a committee or individual to investigate the subject, to report from time to time on the development of the apparatus, and to call attention of the equipment manufacturers to any general criticism on machines and servicing methods.

Appended to the report was a list of questions supplied by the following manufacturers: Balsa Refrigeration Corp. (Frigidor); Clothel Refrigeration Co. (Clothel); Delco-Light Co. (Frigidaire); Frankenburg Refrigeration Machinery Co. (Sanitary); Johns-Manville, Inc. (Audiffren); Kelvinator Corp. (Kelvinator); Lipman Refrigerating Car & Mfg. Co. (Lipman); Simplex Refrigeration Corp. (Simplex); Utility Compressor Co. (Utility); Fred W. Wolf Co.

Utility Heads Tell Experiences With Units in Their Homes

When Mr. Jones had completed his report, the chairman of the meeting invited a discussion of the paper. First to respond was one of the members who said:

"As an innocent user of electric refrigeration for eight years, I want to say a few words on Mr. Jones' remark in regard to the number of refrigerators in operation generally satisfactory. He said 95. I think the 95 should form a secret society of which I might be a sort of an ex-officio member."

He then said that if he asked the 95 the following questions, their answers would be indicated:

"Have you had the regulator stick?" "Yes."

"Have you had sulphur dioxide get loose and spoil the nickelware?" "Yes."

"Have you been without electric refrigeration for a while?" "Yes."

"Why don't you come right out and say so?" The answer to this, he said, would be "My wife won't let me."

Once you get them in, he commented, you can't get them out. He told how he had at one time made a survey on the comparative costs of the two types of refrigeration, and then had one installed (built by Fred W. Wolf) in his house. He had had four refrigerators in eight years.

If the vacuum cleaner breaks, you use the broom, but if the electric refrigerator breaks, you have no alternative, the speaker told the group. The difficulty, he said, was that the manufacturers sell the electric refrigerator, install it, and leave. Then the troubles begin.

"I think that this paper will mark the beginning of the history of electric refrigeration, because I think it is bound to come, and should come right away," the member said.

To give an idea of the then prevalent methods of merchandising this new appliance, he told of some automobile manufacturer who got hold of a refrigerator developed from the original Domelre machine. He saw in it a wonderful opportunity to merchandise in a manner similar to that used on automobiles.

So they divided the country into districts, set up sales agents, got out advertising, all without first perfecting the machinery.

Next to enter into the discussion was K. H. Mohr of Philadelphia, who agreed with the previously expressed opinion on his experiences.

He told of a lawyer who purchased a refrigerator, had trouble with it, and wanted it replaced. The power company got the manufacturer to replace it, then the lawyer wouldn't pay his electric light bill because he said that the machine ran 48 hours; its thermostat didn't work.

R. R. Young of the New York Edison Co. next told the association that after he talked with Mr. C. K. Nichols an analysis of 85 of the company's users was compiled.

With 52 Frigidaires and 29 Kelvinators in the territory, questioning of the company's agents revealed that the average revenue per customer amounted to between $40 and $75. Of these refrigerators, only eight Frigidaires had given trouble, and only one Kelvinator.

He disagreed with Mr. Jones' estimate of the operating costs as set up in his table, which he believed to be too high. He also stated that most people did not consider the interest and depreciation as part of the operating cost.

"One of our men installed a new refrigerator (Kelvinator) in his home last year. While his ice bills used to be $30 a month, his electric refrigeration had cost him but $6.00 for current rates per month," concluded Mr. Young.

Claiming that in his territory, at least, the troubles connected with electric refrigerators were negligible (with 250 in use) was R. R. Tillman of Baltimore.

He advised that the central stations should push sales, however, endeavoring to push no one line since the servicing was so incomplete on the manufacturer's part.

He then called the association's attention to a company bringing out an air-cooled machine (Hartford Automatic Co.), using no liquid refrigerant, no water for cooler, and having a small electric motor which drove an air compressor with a maximum pressure of 15 lbs.

It was moved that a committee recommended by Mr. Jones in his paper be appointed, and this was done, concluding the discussion of Mr. Jones' paper.

Table 1—Figures Used in 1922 to Compare Cost Of Electric and Ice Refrigeration

Comparative Annual Cost of Operating Electric Household Refrigerator and The Ordinary Type of Ice Box

	Ice Refrig.	Machine No. 1	Machine No. 2 Type A	Machine No. 2 Type B	Machine No. 3
Cubic content, feet	6	6	6	5	7.5
Cost of cabinet (ice box)	$100.00	$100.00	$100.00	....	....
Cost of refrigerating machine	....	$225.00	$295.00	....	....
Cost of cabinet and machine	....	....	....	$495.00	$550.00
Total cost of refrigerator complete	$100.00	$325.00	$395.00	$495.00	$550.00
Interest on investment	$ 6.00	$ 19.50	$ 23.70	$ 29.70	$ 33.00
Depreciation	$ 10.00	$ 32.50	$ 39.50	$ 49.50	$ 55.00
Operating expense	$ 42.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00
Total annual cost	$ 58.00	$ 82.00	$ 93.20	$109.20	$118.00
Operating Cost					
Rate of interest on above	6%	....	....	....	....
Estimated rate of depreciation	10%	....	....	....	....
Estimated annual consumption	7,000 lbs.	600 kwh.	600 kwh.	600 kwh.	600 kwh.
Estimated rate paid	60¢ cwt.	5¢ kwh.	5¢ kwh.	5¢ kwh.	5¢ kwh.

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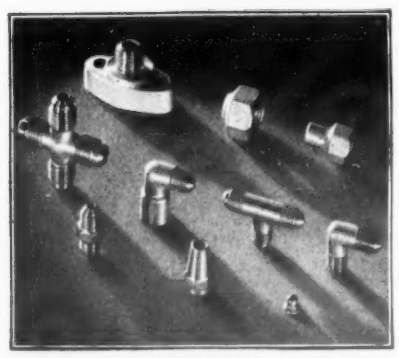

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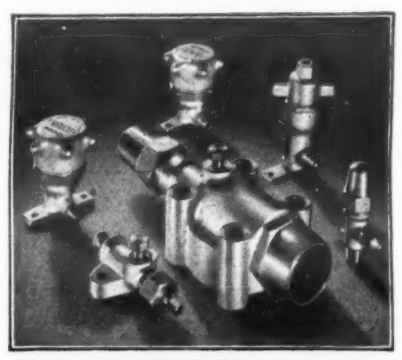

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Air Conditioning Made Easy

By F. O. JORDAN

Proper Selection of Coils Is Important for Proper Operation of System

SECTION No. 3

COIL PERFORMANCE

This discussion of coil performance is included in the belief that an understanding of this topic will assist the air conditioning engineer in his equipment selection.

The proper selection of the air conditioning coil and its operating conditions is very important. If the "doughboy" in the front line trench falls down on his job, the most carefully planned and efficient service of supplies is rendered futile. If the air conditioning coil, whose duty it is to defeat the rampant B.t.u. in hand-to-hand combat, fails to do its duty, the efforts of the most carefully designed and efficient condensing unit to do its part in the war on discomfort, are wasted.

Prior to its use in connection with the cooling and drying of air, a great deal was learned about the surface type of heat exchanger—commonly referred to as a "coil"—during its period of service as a means of heating air.

This is unfortunate. It is unfortunate because certain practices which originated during its service in heating have been carried thoughtlessly over into its cooling and dehumidifying service where they actually are detrimental because of the vastly different problems to be encountered in the latter field.

For example, while the prime object of the heating engineer is to obtain the maximum sensible capacity per unit of coil volume and weight, the most desirable characteristics for the cooling and dehumidifying coil is the ability to develop a high latent-to-total capacity ration without going to the low refrigerant temperatures and suction pressures which penalize that most expensive part of the air conditioning system, the condensing unit; and the ability to quickly evacuate the moisture resulting from dehumidification so that the coil itself will not be penalized by becoming chocked.

While functioning as a heating surface, the duties of the coil are simple. It is called upon to do sensible work only, and the spacing of its adjacent surface is determined only by their resistance to the passage of air.

But when the coil is applied to summer air conditioning for comfort, its duties multiply. Not only must it do sensible heat removal but it is called upon to do latent work as well.

Furthermore, it must quickly evacuate the moisture resulting from the latent work which it has done, or its capacity of performing either cooling or dehumidifying work is seriously impaired.

In order that there may be a recognition of the problem and a comprehension of their solution, we list the factors which govern the performance of the coil and note the specific influence of each, as ascertained through exhaustive research work.

Six Variables Influence Capacity of Coils

There are six variables which influence the capacity of the properly designed and constructed coil and of course many others which interfere when the coil is improperly designed or constructed. These six variables are as follows:—

1. Dry Bulb Temperature Of Entering Air

A rise in dry bulb temperature results in an increase in sensible capacity and a simultaneous decrease in latent capacity so that the ratio of latent to total capacity is lowered. The sensible capacity is increased because the temperature differential between dry bulb and average coil surface is increased. The increased load imposed by this increased differential produces a rise in average coil temperature (because of the resistance of the fin to heat travel) even though the refrigerant temperature is held constant.

This rise in average coil temperature produces a decrease in the temperature differential between dew point temperature of entering air and average coil temperature, hence the reduction in latent capacity.

Since the rise in fin temperature retards the increasing of the temperature differential between fin and increased dry bulb of entering air, the increase in sensible capacity is retarded at the very time when it is needed to curb the rising dry bulb. This shows the necessity of a good fin with a good bond with the primary surface.

In the field, the refrigerant temperature is not held constant but is allowed to rise with rising loads so that the increase in sensible capacity due to the higher dry bulb temperature is less, while the attendant decrease in latent capacity is greater than would be the case if the refrigerant temperature were held constant.

2. Dew Point Temperature Of Entering Air

A rise in dew point temperature of entering air results in an increase in latent capacity, and a simultaneous decrease in sensible capacity so that the ratio of latent to total is increased. The latent capacity is increased because the temperature differential between dew point and average coil surface is increased.

The increased load imposed by this increased differential produces a rise in average coil surface temperature (because of the resistance of the fin to the flow of heat through it) even though the refrigerant temperature is held constant. This rise in average coil temperature produces a decrease in the temperature differential between average coil and dry bulb of entering air, hence the reduction in sensible capacity.

Since the rise in fin temperature retards the increase in temperature differential between dew point temperature of entering air and average coil surface, the increase in latent capacity is retarded at the very time when it is needed to curb the rising dew point. This effect is lessened by a fin which permits an easy flow of heat.

In the field, the refrigerant temperature is not held constant but is allowed to rise with rising loads, so that the increase in latent capacity, due to rising dew point, is less, while the attendant decrease in sensible capacity is greater than be the case if the refrigerant temperature were held constant.

3. Air Velocity Through Coil

An increase in air velocity results in an increase in net latent capacity.

The increased load imposed by the increased air velocity, produces a rise in average coil surface temperature, even though the refrigerant temperature is held constant. This rise in surface temperature decreases the temperature differential between surface and dew point, the differential between surface and dew point being decreased by the larger percentage because dew point is lower than dry bulb.

Thus, both the sensible and latent heat removal done per pound of air are reduced by an increase in air velocity, the reduction in latent being greater than the reduction in sensible capacity, so that an increase in air velocity always lowers the ratio of latent to total.

But although less sensible and latent work is done per pound, the fact that more pounds of air are treated at higher velocities, raises net sensible capacity under all conditions, and always raises net latent capacity except in some cases where dew point and surface temperature already were very close together. In such cases, the net latent will be decreased or even altogether eliminated by an increase in air velocity.

In actual practice, the increased load imposed by an increased air velocity, produces a rise in refrigerant temperature which in turn results in an additional surface temperature rise. This results in a smaller increase in both sensible and latent capacities and produces a greater decrease in ratio of latent to total than would be the case if refrigerant temperature were held constant.

4. Refrigerant Temperature In Coil

A rise in refrigerant temperature or weather temperature in the case of the chilled water coil, results in a lowering of both sensible and latent capacity because of the decrease in temperature differential between dry bulb and coil surface, and between dew point and coil surface.

Since dew point is lower than dry bulb, the reduction in temperature differential between dew point and coil surface is greater in percentage than the reduction in temperature differential between dry bulb and coil surface. For this reason the decrease in latent capacity is greater than the decrease in sensible capacity, so that a rise in refrigerant temperature results in a lowering of the ratio of latent to total.

4A. Water Velocity

In cases where water or brine is the refrigerant used, a decrease in water or brine velocity has an effect upon coil performance similar to that obtained when the refrigerant temperature is raised, that is, sensible and latent capacities are lowered, latent being lowered more than sensible so that ratio of latent to total capacity is lowered also.

The reason for this is because the coefficient of heat transmission of the inside surface of the tube is lowered, which in turn allows a rise in outside surface temperature and because the greater volume of water reduces the water temperature rise, resulting in a lower average temperature in coil.

5. Ratio of Primary to Secondary Surface

Up to a certain point, an increase in ratio of primary to secondary coil surface, obtained by shortening the fin (or by decreasing the tube spacing, provided that the fin spacing is such that condensate is not trapped), tends to result in an increase of both sensible and latent capacities.

The average surface temperature is brought closer to refrigerant temperature differential between coil surface and dry bulb, and between coil surface and dew point.

The latter differential is increased by the larger percentage since dew point is lower than dry bulb, so that the increase in latent capacity is greater than the increase in sensible capacity. Thus an increase in primary to secondary, results in a rise in ratio of latent to total.

Up to a certain point an increase in fin spacing will raise the coil capacity, because condensation is then more readily evacuated.

6. Depth of Coil in Direction of Air Flow

Within reasonable limits, an increase in depth of coil in the direction of air flow results in a rise in sensible capacity and a greater rise in latent capacity. The ratio of latent to total capacity is increased.

The capacities are increased because the final dry bulb and dew point temperatures of the treated air are lowered by the increased exposure to the coil surface.

Latent capacity is increased more than sensible capacity because the percentage of increase in dew point reduction of air is greater than the percentage of increase in dry bulb reduction, which in turn is true because the dew point temperature of entering air must be lower than the dry bulb temperature.

How to Apply Factors

These are the factors which are at the disposal of the air conditioning engineer. By proper and intelligent use of them, he can select equipment lower in cost and more satisfactory in operation than equipment which fundamentally is not right.

As for the first two factors, "dry bulb" and "dew point," they are set within rather narrow limits by the demands of comfort, and as a general rule cannot be varied greatly.

The remaining four factors must be determined by good practice in view of the usual load conditions to be met in the field. If any one of them is very much out of line, one or more of the other will be forced to a ridiculous and inefficient extreme so the performance fits the load.

(To Be Continued in Next Issue)

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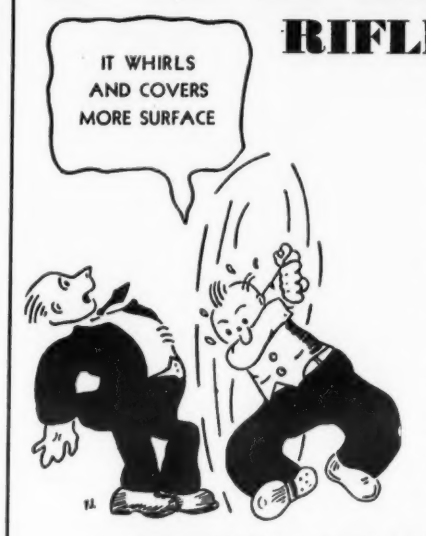

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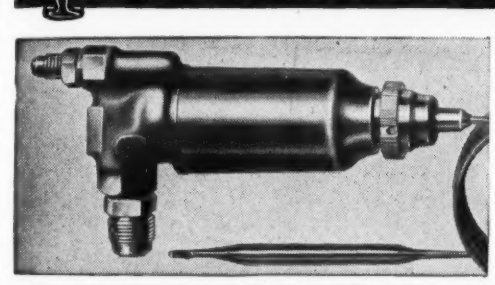

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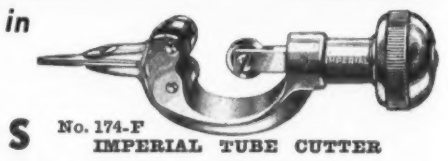

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Willis Carrier Began Experiments In 1906 Which Form Foundation For Modern Air Conditioning

Universally acknowledged to be the "father of modern air conditioning" because of his many inventions and contributions to the field, Willis H. Carrier, chairman of the board of the Carrier Corp., began his experiments with the problem of domestic and commercial cooling more than 30 years ago.

Upon graduation from Cornell University in 1901, Mr. Carrier was engaged as research engineer by the Buffalo Forge Co., Buffalo, N. Y., and soon became interested in air circulation and air washing problems and developments.

By 1906, he had become chief engineer of the company and embarked on a series of experiments in the air conditioning field.

Inventions Varied

Ranging from lines of small domestic air conditioners and air-conditioning systems which he has developed, Mr. Carrier has designed installations for such varied fields as railway cars and the United States Capitol building and the White House, in Washington, D. C.

Through his mathematical investigations and experimental and development work, he has produced numerous basic and fundamental inventions which have proved to be the foundation for modern air conditioning engineering practice.

Immediately upon graduation from Cornell University in 1901 he was employed by the Buffalo Forge Co., Buffalo, N. Y., then large manufacturers of blacksmith's forges and in a smaller way, of blowers and "pipe-coil" heaters. (Then called "fan blast heaters.")

Mr. Carrier at once became interested in the latter phase of the business and assisted materially in its rapid development.

Perfected Rating Tables

He formulated a technical method of testing and rating blowers (or fans) and fan system heaters. He then conducted the tests and first published a system of scientifically-conceived rating tables defining the capacities of fans at various volumes, speeds and resistances, and of heaters at various steam pressures and air velocities based upon accurately calculated free areas.

Shortly thereafter, when the company encountered the problem of providing clean air, he developed the spray-type air washer. Later when the potentialities of air conditioning first appealed to him, he improved the basic apparatus and produced the spray-type conditioning machine (humidifier and dehumidifier) which stands today (with other refinements) as the most efficient apparatus available for air treatment.

Studying closely the first applications of his spray-type air washer, Mr. Carrier observed the fundamental importance of humidification (control of the air's moisture content) and found that he could regulate this vital factor by means of the spray water.

First Dew-Point Control

He thereupon developed and patented the dew-point control—a method of regulating humidity by controlling the temperature of the spray-water in the conditioning machine (then called either an air washer from its first function, or a humidifier, from its later function).

The machine was finally designated a "conditioning machine" when Mr. Carrier showed that it performed all three functions; cleaning, humidification in winter, and dehumidification in summer.

Immediately following his development of the conditioning machine and the dew-point control, Mr. Carrier undertook an exhaustive study of psychrometric phenomena, including the first study of dehumidification by employment of mechanical refrigeration. Then was born, after some 10 years of labor, the science which is now known as scientific air conditioning.

As a part of his work in the development and design of air conditioning and its equipment, Mr. Carrier presented to the American Society of Mechanical Engineers in 1911, his *Rational Psychrometric Formulae,* a study which, translated into many languages, constitutes the foundation upon which has been built today's science of air conditioning.

Included in this paper was the scientific psychrometric chart contemplating atmospheric temperatures and pressures.

Later, directing the labors of his associate, D. C. Lindsay, physicist, Mr. Carrier completed exhaustive determination of dew-point temperatures confirming the range of his previously published psychrometric chart and including conditions both above and below this range. This work, carried out in the laboratory of Cornell University, stands today as the final authority upon the subject.

Published Works Numerous

In 1914 the engineers' handbook, *Fan Engineering,* was first published and edited by Carrier. This work has been revised as the art has progressed, and contains many original tables and data indispensible to the fan engineer.

In addition to these major writings Mr. Carrier has contributed papers to the *Transactions of the American Society of Mechanical Engineers,* the American Society of Heating and Ventilating Engineers, the American Society of Refrigerating Engineers and other professional and scientific bodies.

As air conditioning has grown and expanded, Mr. Carrier has consistently contributed to its development. He had much to do with the present perfection of the centrifugal fan and the centrifugal pump.

He determined and published basic data pertaining to the friction of air in ducts at various velocities and pressures. He developed practicable means to insure uniform and effective air distribution and circulation within buildings, dryers and conditioners. He designed and made available the diffuser outlet.

Developed Ejector System

As conditioned air became more and more a successful, in many instances an indispensible tool of industry and a means of insuring human health and comfort, Mr. Carrier devised the ejector system of air conditioning, in which a relatively small volume of air is ejected through converging nozzles in such manner that it induces the movement of circulation of from three to five times its own volume thereby operating an effective circulation, within the given enclosure, whether this be a factory, a dryer or conditioner, a theater or other similar public building five times larger.

The ejector system and another of Mr. Carriers' outstanding contributions, the downward diffusion system of air distribution, have had much to do with the present wide-spread utilization of air conditioning for the insurance of human comfort and protection of human health.

Systems Widely Used

Today in hundreds of theaters, both motion picture and legitimate, auditoria, great arenas, such as the Harmon Stadium, Chicago, entire office buildings, hotels, department stores, offices of the President of the United States, United States Senate, the London (England) County Council Hall and British Secretariats at Delhi and Bombay, India, and in many similar applications, scientific air conditioning, as developed by Mr. Carrier, has been installed.

This is in addition to the benefits which air conditioning has conferred upon the more than 200 distinctly different industries in which it has been applied, from rayon to railroads, largely using Carrier equipment.

Among his other achievements, Mr. Carrier designed and developed the closed system of evaporative generator cooling, an apparatus which, utilizing the phenomenon of evaporative cooling and re-circulating the same air continuously, has provided an effective, inexpensive, and safe means of cooling the highly developed electric generators of today.

Mr. Carrier has further contributed to the art he fathered by developing unit apparatus of various types, making air conditioning available inexpensively in thousands of applications where central station equipment would be unwieldly or prohibitively costly.

Develops Unit Apparatus

Among these units are the processing cabinet—a complete air conditioning equipment in miniature attached to an insulated windowed cabinet, and a laboratory in a unit—affording an effective, portable, readily adaptable means of studying the potentialities of air conditioning as applied to any purpose, in any locality.

The unit air conditioner, installed usually without ducts, brings to the smaller requirement many advantages of the larger central station systems and is widely used for many purposes.

With Dr. Albert Klein, of Stuttgart, Germany, Mr. Carrier has developed a unit-central system of air conditioning which is a new application of air conditioning for the individual rooms of hotels, office buildings, and similar structures.

With L. C. Soule, Mr. Carrier developed and made available the first standardized, light-weight, non-corrodible, non-ferrous fan system heat-surface.

Recently Mr. Carrier developed a house heating and conditioning unit, a compact, automatic gas-fired set of equipment. The unit may be used for winter conditioning—heat, *humidity,* circulation filtration,—and with the addition of a refrigerating unit will cool and dehumidify in summer.

New Centrifugal Unit

Most recent among Mr. Carrier's many contributions to the science of air conditioning has been the invention of the centrifugal refrigeration machine, a unit using a harmless liquid refrigerant which may be placed with safety in any public building to operate for cooling or dehumidification in conjunction with an air-conditioning system.

Mr. Carrier has also been active in organization work in the industry, having served as president of the A.S.H.V.E. in 1931, and president of the A.S.R.E. in 1927. He is also a member of the A.S.M.E.

At the World Engineering Congress held during 1929-30 in Japan, Mr. carrier represented both the A.S.H.V.E. and A.S.R.E. He has been a member of the former society since 1913, serving as first and second vice-president and as a member of several technical committees.

His contributions to the science of air conditioning won for him the 1934 medal of the A. S. M. E. In 1932, he was awarded the F. Paul Anderson gold medal "for distinguished scientific achievements in the field of heating, ventilating, and air conditioning" at the annual banquet of A.S.H.V.E.

In 1931, Mr. Carrier received the John Scott medal from the Board of Directors of City Trusts of Philadelphia. Lehigh University conferred on him the degree of Doctor of Engineering in June, 1935.

University of Illinois Starts Course in Air Conditioning

URBANA-CHAMPAIGN, Ill. — Practical air-conditioning instruction can now be obtained at the University of Illinois, here, following installation of one of the most complete pieces of air-conditioning apparatus in the country.

This working model, installed during the summer months, is large enough to condition a lecture room with a capacity for 100 students, and will be available to all students of air-conditioning engineering.

In addition to its availability for instruction of both graduate and undergrauduate students, the apparatus may be used for research.

Members of the College of Engineering staff who designed and selected the apparatus, according to Prof. O. A. Leutwiler, head of the mechanical engineering department, are Prof. J. A. Polson, Prof. W. H. Severns, Prof. H. J. Macintire, Prof. A. P. Kratz, and Asst. Prof. M. K. Fahnestock.

Suitable for both summer and winter air conditioning, the unit will have a large fan, dry air filters, an air washer, steam tempering coils, steam reheating coils, and equipment for three different ways of cooling and dehumidifying the air.

Much of the equipment has automatic controls. Thermometers and thermocouples for measurement of air temperatures will be inserted for testing all individual parts.

The Buyer's Guide

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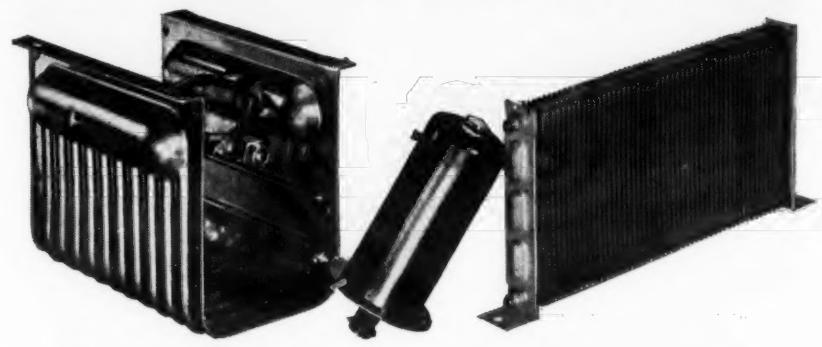

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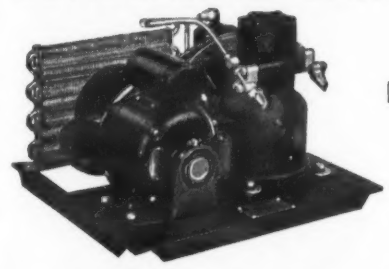

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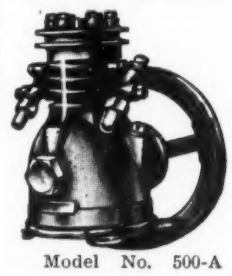

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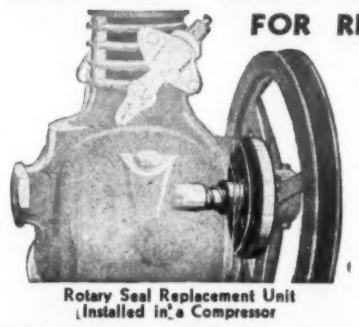

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The Buyer's Guide

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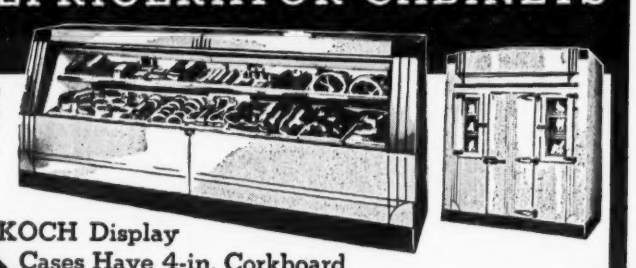

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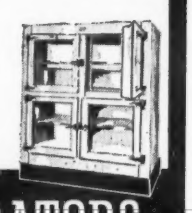

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TYLER'S NEW WELDED STEEL REFRIGERATOR CASES

At last a general purpose case at a sensible price. Offers every advantage of the most costly cases at tremendous savings. Modern in every detail. Comes equipped with coils. Single and double duty models.

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Hundreds in use. Perfect refrigeration for meat, dairy and delicatessen products and all perishables sold in food stores. Write or wire for all the facts.

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Biographies Give Backgrounds Of Executives Active in Industry Today

In compiling information for the Pioneer Number of AIR CONDITIONING AND REFRIGERATION NEWS, the editors mailed questionnaires to *all* manufacturers in the field, requesting that they be given to any members of the organization worthy of recognition as "industry pioneers."

Most companies answering the questionnaire chose to include personal histories with their story of the firm's development. Several other individual histories sent in response to the query are presented below.

Since the questionnaire was sent out rather late, only a limited number were returned in time for this issue. Others will be published later.

Carrier Corp. boasts a number of men who are pioneers in air-conditioning work and heavy-duty refrigeration applications. Some of them were with Willis Carrier when he formed his own company. Below are given brief sketches giving the highlights in the careers of these men.

E. P. Heckel

E. P. Heckel, vice president of the Carrier Corp., Chicago, began his mechanical career in 1904 as an erecting superintendent for the Buffalo Forge Co., his duties involving the complete erection of all apparatus and equipment.

While working for this company he became familiar with heating and ventilating problems peculiar to manufacturing and chemical industries and their various processes.

Willis H. Carrier, then chief engineer of the Buffalo Forge Co., employed Heckel when he organized the Carrier Air Conditioning Co. of America.

Heckel was transferred to Chicago as sales engineer for Carrier in 1912 and remained in that position until July 1915, when he joined forces with Carrier and associates in the formation of the Carrier Engineering Corp. He was later moved back to New York to handle sales engineering and process development work.

In 1919 he again was transferred to Chicago, this time as branch manager. He has remained there since.

With over 30 years of experience in the art of heating, ventilating, refrigerating and air conditioning, Heckel has written papers on the subject of air conditioning theaters, office buildings, skating rinks, pharmaceutical enterprises, and automobile and bus bodies.

Born and raised in Chicago, his education was obtained in Chicago public schools and in special evening courses. Heckel holds patents relating to processes in the drying of materials, pharmaceuticals, non-shatterable glass, in the textile industry and in the chemical industry.

Margaret Ingels

Margaret Ingels, technical assistant in the price and data department of the Carrier Corp., joined the Carrier organization in 1918. From that year until 1922 she was in the engineering research laboratories, and from 1922 to 1927 did association work with the A.S.H.V.E.

She was a member of the N. Y. Committee on School Ventilation from 1928 to 1929, and she returned to Carrier in 1929 in the engineering department.

Donald French

Donald French, vice president in charge of engineering of the Carrier Corp., joined the organization in October, 1930.

Prior to that time he had been with the York Heating and Ventilating Corp., which company he joined in April, 1925. French was graduated from Rennselaer Polytechnic Inst. with a degree of mechanical engineer.

John M. Bickel

John M. Bickel, merchandising manager of Carrier Corp., has been with that company since 1929. In 1927 he joined the Servel Co. of Evansville, Ind., in the capacity of advertising sales manager of the now defunct Holmes Refrigerator Co. in 1929. From the latter he went to Carrier.

Edwin H. Dafter

Edwin H. Dafter, district chief engineer of the Philadelphia branch of Carrier Corp., has helped with the designing and installation of air condtiioning equipment in the U. S. Capitol in Washington, D. C., in the J. L. Hudson Deartment Store, Detroit, Mich. and Radio City buildings, New York. N. Y.

Dafter holds B. S. and M. E. degrees from the Cooper Union Institute of Technology.

Walter Jones

Walter Jones, engineer of Carrier Corp., started in the refrigeration industry in 1914 as sales engineer of the Brunswick Refrigerating Co., New Bruswick, N. J. He was then made experimental engineer in 1916.

In 1920 he became factory engineer with the company in which capacity he served until 1923. In that year he became general superintendent of the Brunswick-Kroeschell Co. In 1925 he was promoted to the position of manager of manufacturing and chief engineer. Jones left the Brunswick company in 1931 and went over to Carrier.

Jones was graduated from the Univeristy of Pennsylvania in 1912. He pioneered in the development of high speed vertical carbon dioxide compressors for marine applications, and in a very low temperature application (—100 to —150° F.) of commercial refrigerating equipment for the chemical industry.

He has been granted patents on improvements in refrigeration compressors, on the application of evaporative cooling combined with storage effect for mine applications, and on improvements in air conditioning of food storage rooms.

Wm. H. Price, Jr.

William H. Price, vice president in charge of sales of the Carrier Corp., was originally connected with the York Heating & Ventilating Corp.

From this concern he went by merger to the Carrier-Lyre Corp., to the Carrier Engineering Corp. and thence to the present Carrier Corp. Price was graduated from the Massachusetts Institute of Technology in 1915.

E. V. Erickson

E. V. Erickson, sales engineer of the Carrier-Brunswick International Division of the Carrier Corp., has been with Carrier since 1929 in the departments of research, engineering, design, export sales, and the division of which he is now sales engineer.

He developed a compensated water regulator valve, and made an office building econograph chart for estimating the earning of air conditioning systems.

John H. Holton

John H. Holton, manager of the eastern contract and service construction departments, Carrier Corp., received his B. S. degree in chemical engineering from the Massachusetts Institute of Technology. He is the holder of several patents.

Clarence E. Scott

Clarence E. Scott, assistant to the vice president, Carrier Corp., went to Carrier in 1931 from the York Heating & Ventilating Corp., Philadelphia, with whom he had been connected since 1924.

Scott has a patent on his design of a split scroll, developed the basic factor method of rating cold diffusing units and developed the first certified ratings of unit heaters.

Edward Thomas Murphy

Edward Thomas Murphy, vice president of Carrier Corp. and manager of the Chicago district, has held these positions since 1931. Before that year, from 1928, he had been vice president in charge of sales and director of the Carrier Engineering Corp.

Murphy began his industrial career in 1902 in the installation service of the Buffalo Forge Co.'s air-conditioning equipment. In 1904 he became sales engineer in the New York office of the B. F. Sturtevant Co.

From there he went in 1907 to Philadelphia as manager of the Buffalo Forge Co. and of their subsidiary, Carrier Air Conditioning Co. of America. In 1915, as one of the founders of the Carrier Engineering Corp., he was secretary and subsequently vice president and director of the organization and manager of the Philadelphia office.

He remained such until 1927, and became vice president in charge of sales in 1928. Murphy invented a dry blast process for blast furnaces and also humidity and temperature controls.

Hans K. Steinfeld

H. K. Steinfeld, development engineer of the Baldwin-Southwark Corp., Philadelphia, has been connected with the DeLaVergne refrigeration division of that company since 1932.

Steinfeld first entered the refrigeration industry in Germany as designer of ammonia and carbon dioxide compressors for marine refrigeration installations under George Niemeyer in Hamburg.

A graduate mechanical engineer of the Polytechnikum in Hamburg and of New York University, Steinfeld became associated with the York Ice Machinery Corp. of Brooklyn, N. Y., in 1928. Two years later he went to the Carrier Engineering Corp. in Newark, his field being industrial air-conditioning installations.

Steinfeld cooperated in the design of the first self-contained unit air conditioner and in the practical application of the heat pump principle for air-conditioning units, for which, together with his associates, he received the John Scott Medal Award in 1933.

Robert J. Thompson

Robert J. Thompson, refrigeration engineer of Kinetic Chemicals, Inc., Wilmington, Del., has worked on the development of refrigerating apparatus and refrigerants, and on the development of export sales in Europe and South Africa.

He was born in Arcanum, O., in 1892 and received his education in public schools and in the I. C. S. Thompson has written articles for several technical journals.

Henry C. Heller

Henry C. Heller, a native of Denmark, is now development engineer of the DeLaVergne air-conditioning division.

In 1926 he received his degree in mechanical engineering from the Universities of Munich and Hanover, Germany. Heller was awarded the John Scott Medal in 1933 and has helped develop high speed compressors and capacity control devices.

Henry L. Galson

Henry L. Galson, product and sales engineer of the DeLaVergne air-conditioning division, was awarded the John Scott Medal for the design and development of the DeLaVergne air-conditioning apparatus in 1933 by the City of Philadelphia.

Born in Vienna, Austria, in May, 1900, Galson attended the Technical University of Vienna, from which he obtained his M. E. degree, and took a graduate course in industrial management at the University of Pennsylvania.

From 1922 to 1925 Galson was research and development engineer in Proctor & Schwartz, Inc., Philadelphia. After leaving that company he joined the Bentz Engineering Corp. of Newark, N. J., as industrial air conditioning engineer, remaining until 1927.

In that year he moved to the Cooling and Air Conditioning Corp., New York City, as development and sales engineer. In 1928 Galson was chief engineer in charge of development and production at the Philadelphia Drying Machinery Corp.

In 1932 he became associated with the Baldwin-Southwark Corp.

In 1927 Galson developed a vertical humidifying air washer used in Bakery Proof boxes. Two years later he developed a high pressure disc fan for use in industrial drying field and in equipment for continuous production in the conditioning and drying

(Concluded on Page 35, Column 1)

BARLUM HOTEL

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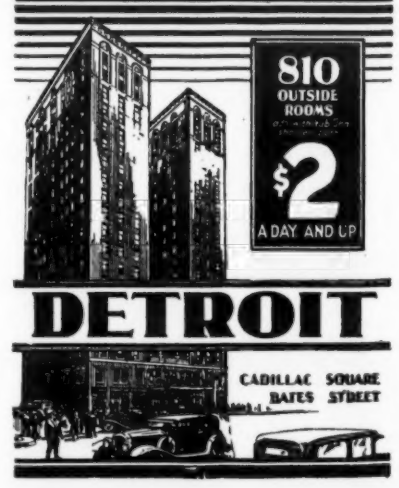

DETROIT

Brief Biographies Of Engineering & Sales Executives

(*Concluded from Page 34, Column 5*)

of ceramics, textiles, rayon, chemicals, etc.

Galson designed and developed in 1932 one of the first self-contained air-conditioning units for homes and offices. The following year he developed a railroad car air conditioner on similar principles.

H. B. Miller

H. B. Miller, vice president of Sanitary Electric Corp., started with the Sanitary Refrigeration Co. in 1920 and was later transferred to the electric division. He developed a non-plugging liquid receiver valve screen and a double-sealing evaporator header gasket.

Miller attended the University of Wisconsin.

B. K. Miller

B. K. Miller, secretary of both the Sanitary Refrigerator Co. and the Sanitary Electric Corp., and brother of H. B., supervised the early development of Sanitary conventional units and cabinets from 1926 on.

He was an industrial adviser during the formation of the Ice Refrigerator Code and a member of the code authority. He is former vice president of the National Manufacturers of Ice Refrigerators Association.

He attended Ripon College and the University of Wisconsin.

E. R. Roll

E. R. Roll, superintendent of Sanitary Electric Corp., developed a magnetically-operated automatic unloading valve for the Standard hermetic unit formerly manufactured in Fond du Lac. Roll studied extension engineering at the University of Wisconsin.

Homer B. Forbes

Homer B. Forbes, superintendent of the Chicago branch of Carrier Corp., started his industrial career in 1905 as a mechanic in drying and air conditioning with the Buffalo Forge Co.

In 1911 he moved to the Carrier organization as construction superintendent of air conditioning and refrigeration. In 1915 he became construction superintendent of the reorganized Carrier Engineering Corp.

Lloyd M. Church

Lloyd M. Church, sales engineer of the Carrier Corp. and stationed in Philadelphia, has specialized in low temperature industrial refrigeration. Church was graduated with a degree in mechanical engineering from Cornell University in 1913.

George H. Clark

George H. Clark, B. S., M. E., director of the Detroit School of Refrigeration and Air Conditioning, was first president of the Detroit chapter of the R.S.E.S. and chairman of the National Educational & Examining Board.

He has contributed articles to technical journals. Clark is a graduate of the University of Michigan.

H. P. Gant

H. P. Gant, vice president of Carrier Corp. stationed in Philadelphia, was president of the American Society of Heating and Ventilating Engineers in 1923. Gant was graduated in 1906 from the University of Tennessee with an electrical engineering degree.

George Edward Wallis

George Edward Wallis, president and general manager of Creamery Package Manufacturing Co., holds patents on developments of numerous applications of refrigeration to the dairy industry and of refrigerating equipment. A graduate of the Massachusetts Institute of Technology with a B. S. degree, Wallis is president of the Dairy & Ice Cream Machinery & Supplies Association.

Otto Paul Heller

Otto Paul Heller, refrigerating engineer of Creamery Package Manufacturing Co., is credited with development work over a long period of years in numerous applications of refrigeration in the dairy industry. Heller attended the Lewis Institute in Chicago.

Arthur W. Conley

Arthur W. Conley, president of Corozone Air Conditioning Corp., is patentee of air-conditioning equipment for the purification, circulation, cooling and humidification of air. He has written four published articles pertaining to air conditioning.

Corozone Corp. claims to have supervised and directed the first national sales and advertising campaign on portable air conditioning in the United States, and to have been the first advertisers on portable air conditioners and purifiers in the *Saturday Evening Post*.

They claim also to have developed and built the first portable room cooling unit in a wood cabinet, and the first room cooling unit combining deodorization, purification and revitalization.

John H. Bracken

John H. Bracken, manager of the industrial uses department of Celotex Corp., designed a fabricated board form of insulation for the early mechanical refrigerators in 1925-26.

He has written numerous papers on the proceedings of the A.S.R.E., of which he is a member.

F. R. Still

F. R. Still, vice president of American Blower Corp., New York, pioneered in the development of fans and blowers for all kinds of service, and pioneered also in the development of the application of heat and cold by air circulation to all kinds of industrial and home uses.

William B. Rorison

William B. Rorison, employe in the supervision engineering department of the Carrier Corp., Newark, joined Carrier in 1932 after having been with the Brunswick Refrigerating Co. from 1913 to 1922 and with the Brunswick-Kroeschell Co. from 1922 to 1932.

Classified

RATES: Fifty words or less, one insertion, $2.00, additional words four cents each. Three insertions $5.00, additional words ten cents each.

PAYMENT in advance is required for advertising in this column.

REPLIES to advertisements with Box No. should be addressed to Air Conditioning and Refrigeration News, 5229 Cass Ave., Detroit, Mich.

POSITIONS AVAILABLE

EXCEPTIONAL OPPORTUNITY as district sales representative with nationally known coil manufacturer. Consideration will be given men with experience in contacting jobbers and distributors of electric refrigeration. We have openings for several capable men who know the commercial business thoroughly. Must be able to sell, teach men how to sell, organize and manage territories and make them produce. Prefer men located in any of the following territories: New York, Boston, Pittsburgh, Jacksonville. Compensation: salary, expenses and bonus. Full particulars regarding experiences and references must be given in first letter which will be held strictly confidential. Box 836. Air Conditioning and Refrigeration News.

FINE BUSINESS Opportunity for active and experienced partner for commercial refrigeration and air conditioning sales field with successfully established organization in metropolitan New York area. No investment required. References thoroughly investigated. Address all replies, covering complete information in first communication, to Box No. 145, Madison Square Station, New York City.

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LONG ESTABLISHED Manufacturer desires correspondence with refrigeration and air conditioning salesmen. Also Sales Engineers who have had requisite experience and are interested in joining a growing business organization. Several positions open for men having considerable experience. Box 852, Air Conditioning and Refrigeration News.

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MANUFACTURER of long standing, producing Refrigeration Machines (Ammonia — Freon — Methyl Chloride) also Air Conditioning Units and other refrigerating equipment both large and small, has some very desirable territory open and desires application from parties having experience and ability to handle a territory. Box 851, Air Conditioning and Refrigeration News.

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SALES EXECUTIVE Available. Here is an outstanding, successful sales executive with an unusually fine record that covers eighteen years' experience in both productive sales management and supervision of field sales for nationally known manufacturers. Right now doing an exceptionally fine job. Has wide personal following and excellent reputation among distributors and jobbers in Middle West, East and southern states. Extensive field experience, makes producers of men and is a real salesman himself. Has decisive, pleasing personality—quick to adjust himself. Knows appliances, domestic and commercial refrigeration and equipment for all of the food handling trades. Is married, a Christian and college educated. Legitimate reason for seeking change and is interested in permanent connection with a reliable house. Is nationally known and a live wire and producer. Address Box 854, Air Conditioning and Refrigeration News.

EQUIPMENT WANTED

ATTENTION Manufacturers and Distributors. We will purchase for cash any surplus quantity of domestic and commercial refrigerators or equipment. We refer you to the National City Bank, Gramercy Park, N. Y. C., for our financial responsibility. All transactions confidential. NATIONAL REFRIGERATOR CO., INC., 352 Fourth Ave., New York City.

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FOR SALE—Refrigerator business 19 miles from New York City. Commercial, 2 domestic lines, oil burners and radio. Reason for selling is ill health. Established 15 years. Box 848, Air Conditioning and Refrigeration News.

FRANCHISE WANTED

WE HAVE A CLIENT located in metropolitan New York financially responsible, with the finest of ratings, with a complete selling and servicing organization, with a centrally located showroom and warehouse who is interested in taking on a line of domestic, commercial and air conditioning equipment. This client of ours has been associated with the refrigerator industry for the past five years. All answers treated in strictest confidence. WORTMAN, BARTON & CO., 381 Fourth Ave., New York City.

REPAIR SERVICE

HALECTRIC LABORATORY is America's pioneer repair house for temperature and pressure controls. Our service, price and precision workmanship are unequalled. Ask your dealer about Warrenol for stuck-up jobs. Send us his name and we will send you a generous sample. HALECTRIC LABORATORY, 1793 Lakeview Road, Cleveland, Ohio.

MAJESTIC & GENERAL ELECTRIC units repaired. Our standard job on these units is $20.00, giving you a six months' guarantee. We also have our $30.00 deluxe job, giving you a two-year written guarantee. Please advise which job you want when sending your units. PENO SERVICE COMPANY, Ft. Smith, Arkansas.

REFRIGERATION CONTROLS, domestic types, repaired. 48 hours. Ranco pencil types $1.75, all box types, $2.00. Majestic $2.50. UNITED GAUGE AND INSTRUMENT COMPANY, 436 West 57th Street, New York City.

GENERAL ELECTRIC and Majestic hermetically sealed units repaired and exchanged. Guaranteed work. Wholesale only. Give model when writing. All prices quoted f.o.b. Chicago. AMERICAN REFRIGERATING ENGINEERS, INC., 2257 Silverton Drive, Chicago, Illinois.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Air Conditioning and Refrigeration News (Formerly Electric Refrigeration News) published weekly at Detroit, Mich., for October 1, 1936.

State of Michigan }ss.
County of Wayne }

Before me, a notary public in and for the State and county aforesaid, personally appeared F. M. Cockrell, who, having been duly sworn according to law, deposes and says that he is the Publisher of the Air Conditioning and Refrigeration News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher: F. M. Cockrell, Detroit, Mich.
Editor: George F. Taubeneck, Detroit, Mich.
Managing Editor: Phil B. Redeker, Detroit, Mich.
Business Manager: George N. Congdon, Detroit, Mich.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Business News Publishing Co.
F. M. Cockrell.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

F. M. Cockrell.

Sworn to and subscribed before me this 24 day of September, 1936.

(Seal.) Leo P. Haller.

(My commission expires April 7, 1939.)

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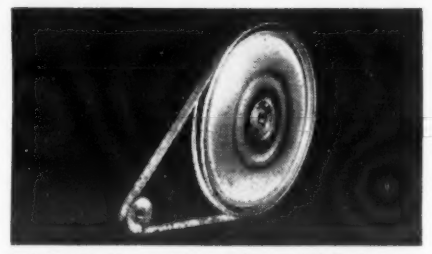

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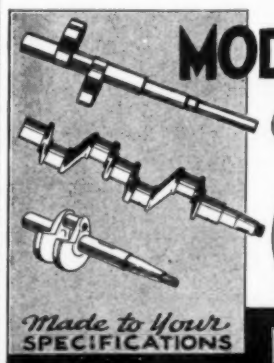

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